

U.S. Environmental Protection Agency

EPA Region 4

3 8 0001

RESPONSE ACTION CONTRACT

Contract No. 68-W-99-043

SITE: Brown's Dump
BREAK: 3.8
OTHER: _____

FINAL
RISK ASSESSMENT
Brown's Dump Site
Jacksonville, Duval County, Florida



BLACK & VEATCH Special Projects Corp.



10224226



**FINAL
RISK ASSESSMENT**

**BROWN'S DUMP SITE
Jacksonville, Duval County, Florida**

**USEPA Work Assignment 007- RSBD-A496
BVSPC Project No. 48107.0207**

SEPTEMBER 2002

**Prepared by
Black & Veatch Special Projects Corp.
1145 Sanctuary Parkway, Suite 475
Alpharetta, Georgia 30004**

Table of Contents

Page No

| | |
|---|------|
| Executive Summary | ES-1 |
| 1.0 Introduction | 1-1 |
| 1.1 Overview of Risk Assessment | 1-1 |
| 1.1.1 General Problem. | 1-1 |
| 1.1.2 Objectives of Risk Assessment | 1-2 |
| 1.2 Site Description | 1-2 |
| 1.3 Scope of the Baseline Risk Assessment | 1-4 |
| 1.4 Organization of the Baseline Risk Assessment Report | 1-5 |
| 1.4.1 Data Collection and Evaluation | 1-5 |
| 1.4.2 Exposure Assessment | 1-5 |
| 1.4.3 Toxicity Assessment | 1-6 |
| 1.4.4 Risk Characterization | 1-6 |
| 1.4.5 Remedial Goal Options | 1-6 |
| 1.4.6 Tables | 1-7 |
| 2.0 Data Collection and Evaluation | 2-1 |
| 2.1 Evaluation | 2-1 |
| 2.2 Selection of Chemicals of Potential Concern | 2-3 |
| 2.3 Uncertainties Associated with Data Evaluation | 2-5 |
| 2.3.1 Data Quantity and Quality | 2-5 |
| 2.3.2 Exposure Units | 2-8 |
| 2.3.3 Elimination of Sediment Data | 2-8 |
| 3.0 Exposure Assessment | 3-1 |
| 3.1 Overview of Exposure Assessment | 3-1 |
| 3.2 Characterization of the Exposure Setting. | 3-1 |
| 3.2.1 Physical Setting | 3-1 |
| 3.2.2 Potentially Exposed Populations | 3-4 |
| 3.3 Identification of Exposure Pathways | 3-5 |
| 3.3.1 Exposure Pathway Analysis | 3-5 |
| 3.3.2 Exposure Scenarios | 3-6 |
| 3.4 Quantification of Exposure | 3-7 |
| 3.4.1 Exposure Point Concentrations | 3-8 |
| 3.4.2 Exposure Dose Algorithms and Assumptions | 3-8 |
| 3.5 Uncertainties in Exposure Pathways and Parameters | 3-12 |
| 4.0 Toxicity Assessment | 4-1 |
| 4.1 Introduction | 4-1 |
| 4.2 Carcinogenic and Noncarcinogenic Toxicity Values | 4-1 |
| 4.2.1 Estimates of Noncarcinogenic Toxicity | 4-1 |
| 4.2.2 Estimates of Carcinogenic Potency | 4-4 |
| 4.3 Chemical-Specific Toxicity Assessments | 4-7 |
| 4.4 Uncertainties Associated with Toxicity Assessment | 4-7 |
| 4.4.1 Reference Doses | 4-7 |
| 4.4.2 Cancer Slope Factors | 4-8 |
| 4.4.3 Metal Speciation | 4-8 |
| 4.4.4 Site-Specific Toxicological Uncertainties | 4-9 |

Table of Contents (Continued)

| | <u>Page No.</u> |
|--|-----------------|
| 5.0 Risk Characterization | 5-1 |
| 5.1 Introduction | 5-1 |
| 5.2 Evaluation of Noncarcinogenic Risks | 5-1 |
| 5.3 Evaluation of Carcinogenic Risks | 5-3 |
| 5.4 Lead Toxicity | 5-5 |
| 5.4.1 Lead Uptake Biokinetics Model | 5-5 |
| 5.4.2 Comparison of Lead Maximum Detected Concentrations to ARARs | 5-9 |
| 5.4.3 Summary of Previous Blood Lead Study | 5-9 |
| 5.4.4 Conclusions | 5-10 |
| 5.5 Uncertainties Associated with Risk Characterization | 5-10 |
| 5.5.1 Central Tendency Evaluation | 5-12 |
| 6.0 Refinement of Contaminants of Concern | 6-1 |
| 6.1 Soil | 6-1 |
| 6.2 Groundwater | 6-2 |
| 6.3 Refined List of COCs | 6-3 |
| 7.0 Remedial Goal Options | 7-1 |
| 8.0 Summary of the Human Health Risk Assessment for Exposure Units 1 and 2 | 8-1 |
| 8.1 Uncertainties Associated With Data Evaluation | 8-1 |
| 8.2 Chemicals of Potential Concern | 8-3 |
| 8.3 Exposure/Toxicity Assumptions | 8-3 |
| 8.4 Risks and Hazards | 8-4 |
| 8.5 Contaminants of Concern and Remedial Goal Options | 8-4 |
| 8.6 Remedial Goal Options | 8-5 |
| 8.7 Data Gaps | 8-5 |
| 8.8 Evaluation of Residential Areas | 8-6 |
| 9.0 References | 9-1 |

Tables

| | | |
|----------|---|-----|
| Table 5A | Comparison of Maximum Detected Concentrations of Lead to ARARs and Screening Values | 5-9 |
|----------|---|-----|

Figures

| | |
|------------|---|
| Figure 2-1 | Soil Sample Locations |
| Figure 2-2 | Soil Sample Concentrations |
| Figure 2-3 | Groundwater and Surface Water Sample Locations |
| Figure 3-1 | Human Health Conceptual Site Model |
| Figure 5-1 | Hypothetical Mean Blood Lead Level Graph - Current Child Resident Exposure Unit 1 - Surface Soil |
| Figure 5-2 | Hypothetical Mean Blood Lead Level Graph - Current Child Resident Exposure Unit 2 - Surface Soil |
| Figure 5-3 | Hypothetical Mean Blood Lead Level Graph - Future Child Resident Exposure Unit 1 - Surface Soil and Groundwater |

Table of Contents (Continued)

| | |
|------------|--|
| Figure 5-4 | Hypothetical Mean Blood Lead Level Graph - Future Child Resident Exposure Unit 2 - Surface Soil and Groundwater |
| Figure 8-1 | Soil Sample Concentrations Onsite |

Appendices

| | |
|------------|---|
| Appendix A | Risk Assessment Tables |
| Appendix B | Risk Assessments for Residential Areas |
| Appendix C | Comparison Data for 296 Surface Soil Samples from Residential Areas |
| Appendix D | Toxicity Profiles |
| Appendix E | Central Tendency Evaluation from Residential Areas |

Executive Summary

The former Brown's Dump site (hereinafter referred to as "the site") is an approximately 50-acre area located north of West 33rd Street, west of Pearce Street, and south and east of Moncrief Creek in Jacksonville, Duval County, Florida. From 1949 to 1953, the site was an operating landfill used to deposit ash from the City of Jacksonville municipal solid waste incinerator. Additionally, Clinton Brown, former property owner, stated that when the incinerator was not functioning, municipal waste was brought directly to the site (EMCON, 1995). Mr. Brown further noted that the site was used as a hog farm before and after the dumping, and a portion of the dump was used as a vegetable garden (EMCON, 1995).

In 1955, approximately 14 acres of the site were obtained by the Duval County School Board, and the Mary McLeod Bethune Elementary School was built (EMCON, 1995). Approximately 2 acres were acquired by the Jacksonville Electric Authority (JEA) to construct an electrical substation (EMCON, 1995). The site is currently also occupied by several single- and multiple-family residences. Two apartment buildings are located in the area, the Bessie Circle Apartments and the Moncrief Village Apartments.

Ash is present within the 50-acre area at depths varying from the surface to 22 feet below ground surface. The deepest ash is present within the School Board and JEA property, with relatively less deep ash presence in the residential areas. Although ash varies in color, it is identified by the presence of glass and metal fragments and it is generally present at thicknesses of several inches to several feet across the site (EMCON, 1996). The boundaries of the ash are unclear; however, it is visible in the area underneath the school property, the Bessie Circle neighborhood, residences along Pearce Street, and the electrical substation.

The U.S. Environmental Protection Agency (EPA) first assessed ash sites in Jacksonville in 1985. Two incinerator sites (Forest Street and 5th & Cleveland Incinerator) and two disposal sites (Brown's Dump and Lonnie C. Miller, Sr. Park) were found to contain similar ash from incineration facilities that burned similar municipal waste streams. The incineration process generated an ash residue, which sometimes contained significant levels of lead, heavy metals, and other contaminants. Incineration processes can also produce dioxin constituents as a result of incomplete combustion. This report contains the baseline risk assessment for the Brown's Dump site.

On September 1, 1999, the City of Jacksonville entered into a Consent Order with EPA to conduct a Remedial Investigation/ Feasibility Study (RI/FS). The EPA, under the authority of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), tasked Black & Veatch Special Project Corp. (Black & Veatch) to conduct oversight of the RI/FS activities and perform the baseline human health and ecological risk assessment for the site. Black & Veatch prepared this baseline risk assessment under Contract Number 68-W-99-043 with EPA Region 4 and under specific authorization of EPA Region 4 through Work Assignment Number 007-RSBD-A496.

For purposes of the risk assessment, the former Brown's Dump site was divided into two primary areas. Area 1 contains the elementary school property and a fenced, grassy area. The JEA electrical substation is located inside this fenced area. Area 1 was divided into two subareas: exposure unit 1 (the unrestricted school property) and exposure unit 2 (the currently restricted area north of the school). Area 2 contains all of the surrounding parcels of land (i.e., residences, apartment buildings).

Chemicals of potential concern (COPCs) for Area 1 were as follows:

- **Soil:** aluminum, antimony, aroclor 1260, arsenic, barium, cadmium, carcinogenic PAHs, chromium, copper, pesticides, dioxins, iron, lead, manganese, vanadium, and zinc.
- **Surface Water:** aluminum, arsenic, barium, chromium, iron, and manganese.
- **Groundwater:** aldrin, aroclor 1016, arsenic, gamma-chlordane, DDE, heptachlor, heptachlor epoxide, iron, and manganese.

Lead is one of the primary COPCs at the site (Areas 1 and 2); therefore, many samples were analyzed for lead only. Most of the lead samples were analyzed in the field by XRF. A percentage of the lead samples were also submitted to a laboratory for confirmatory analysis. Since XRF data are likely to underestimate the concentrations of lead at the site, EPA expects XRF measurements between 200 mg/kg and 400 mg/kg to be confirmed by laboratory analysis. To ensure that XRF lead measurements below 200 mg/kg are not actually above 400 mg/kg (the threshold of concern for lead), EPA further evaluated the XRF and laboratory data for lead. The evaluation indicated an error of 1.7 percent when XRF lead measurements under 200 mg/kg were compared with corresponding fixed laboratory analytical lead measurements exceeding 400 mg/kg. In other words, 98.3% of XRF samples with less than 200 mg/kg lead also show a lead concentration from a fixed laboratory less than 400 mg/kg, the risk based remedial goal option for lead.

Metals are generally compared to site-specific background concentrations when selecting COPCs for a site. If the maximum detected concentration of an inorganic chemical is less than two times the mean background concentration, the chemical is excluded as a COPC in that medium. Although samples were collected during the RI field investigation to serve as background samples for the Brown's Dump site, inorganic compounds detected in soil were not screened against the background samples due to the uncertainty associated with obtaining "true" background samples from this area (i.e., the boundaries of the ash had not been delineated). Therefore, no metal was excluded as a COPC in soil based on a comparison with background. This may result in an overestimation of risk.

Fifty-three dioxin samples analyzed by Draft Screening Method 4425 were not used in the baseline risk assessment because of uncertainty associated with the analytical method. This may lead to an under- or overestimation of risk.

The risk assessment conservatively assumed that current and future use of the unrestricted school property and the currently restrictive area north of the school is residential. This assumes that children attending Mary McLeod Bethune Elementary School live at a nearby home that is also part of the former Brown's Dump site. Therefore, it was assumed that current and future residents may be exposed to COPCs in surface soil at the school property and the restricted area north of the school. Current and future residents may also be exposed to site-related chemicals during recreational activities by having direct contact with contaminated surface water in Moncrief Creek. Also, the future resident was assumed to be exposed to subsurface soil brought to the surface during construction or renovation.

Site-specific exposure information was unavailable; therefore, EPA default values and professional judgment were used to select exposure assumptions for the various receptors evaluated in the risk assessment. These exposure assumptions are likely to overestimate hazards and risks.

Calculated risks and hazards were below applicable thresholds (a total HI greater than 1 and an incremental excess lifetime cancer risk of $1\text{E-}04$) for current residents exposed to surface soil at the unrestricted school property and surface water in Moncrief Creek. However, current residents exposed to surface soil at the restricted area north of the school and surface water had a total HI value that exceeded 1 and total incremental lifetime cancer risk that exceeded $1\text{E-}04$.

Calculated risks and hazards were all above applicable thresholds (a total HI greater than 1 and a cumulative excess lifetime cancer risk of $1\text{E-}04$) for future residents exposed to the environmental media

in Area 1 (the future scenario included evaluation of exposure to groundwater).

The risk characterization identified a total of 15 chemicals as COCs in Area 1 soil: aluminum, antimony, aroclor 1260, arsenic, barium, cadmium, carcinogenic PAHs, chromium, copper, dieldrin, iron, lead, manganese, 2,3,7,8-TCDD, and zinc. Seven chemicals were identified as COCs in groundwater: aldrin, aroclor 1016, arsenic, heptachlor, heptachlor epoxide, iron, and manganese. No COCs were identified in Moncrief Creek.

The hazards and risks presented in the risk characterization are not absolute estimates of risk that would result from exposure to the environmental media at in Area 1 since uncertainties are inherent in the risk assessment process. Most of these uncertainties result in the potential for overestimation of risk. To provide perspective for risk managers, the number of COCs identified in the risk characterization (listed above) was refined by examining any chemical-specific uncertainties that may exist. Based on this examination, the refined lists of COCs for Area 1 of the Brown's Dump site are presented below:

- **Soil:** antimony, aroclor 1260, arsenic, barium, cadmium, carcinogenic PAHs, copper, lead, manganese, 2,3,7,8-TCDD, and zinc.
- **Groundwater:** aroclor 1016 and manganese.

Site-specific RGOs were developed for the refined list of COCs in soil and groundwater at Area 1. RGOs were developed for a range of target risk levels (HQ equal to 0.1, 1, and 3 for noncarcinogenic effects and risk level equal to 1E-06, 1E-05, and 1E-04 for carcinogenic effects).

Examination of the distribution and detected concentrations of COCs revealed a trend in Area 1 surface soil samples. Generally whenever a soil sample presented an unacceptable risk or hazard (i.e., COCs were identified and RGOs were calculated), ash is visible at that location or lead is present at concentrations exceeding 400 mg/kg, EPA's screening value for residential soil. With the exception of three surface soil locations (BD-SS-07, BD-SS-09, and BD-SS10), lead was detected at concentrations exceeding 400 mg/kg at each surface soil location where a chemical-specific RGO was exceeded.

The risk assessment also evaluated risks and hazards that may result from exposure to surface soil at residences surrounding the Brown's Dump site (Area 2). COPCs for the residential areas included carcinogenic PAHs, dioxins, aroclor 1260, pesticides, and metals.

The risk assessment assumed that one yard represented an exposure unit for a given receptor. A composite sample was collected from each yard that was evaluated; therefore, it was assumed that exposure point concentrations in a resident's yard were equal to the detected concentrations of COPCs in the sample collected from that yard.

It was not feasible for the risk assessment to quantitatively evaluate exposure to surface soil from 306 locations (exposure units). Therefore, an attempt was made to identify the most highly contaminated samples so that risks and hazards could be estimated for these locations. It was assumed that risks and hazards resulting from exposure to surface soil at these locations would represent the "worst case scenario" for the yards that were sampled during the RI investigation. As a result of this evaluation, ten surface soil samples were quantitatively evaluated.

The analytical data from each of the remaining 296 locations were evaluated qualitatively by comparing the detected concentration of each COPC to its chemical-specific RGO. If the detected concentration of a chemical was greater than the RGO corresponding to an HQ of 1 or a cancer risk of 1×10^{-6} , further action may be required at that sample location (e.g., additional sampling, soil removal). Detected concentrations of COPCs in 266 of the 296 samples were all below RGOs. However, a total of 30 surface soil samples contained COPC concentrations that exceeded at least one RGO. Lead was the only contaminant of concern in 26 samples (i.e., lead was the only COPC detected at a concentration that exceeded an RGO). One surface soil location, sample BDSB058, contained both lead and carcinogenic PAHs at concentrations that exceeded their respective RGOs. Carcinogenic PAHs were detected at concentrations that exceeded the RGO of 0.09 mg/kg at two surface soil locations, samples BDSB071 and BDSB340. Sample BDSB104 contained arsenic at a concentration that exceeded its RGO of 23 mg/kg. Lead was detected at concentrations of less than 50 mg/kg in all three of these samples.

Soil lead concentrations greater than 400 mg/kg in residential areas should be considered a potential health threat. The degree of threat depends on the bioavailability of the lead. Due to the concentration of lead in soil, exposure to lead at the site may present a significant risk to receptors at the site if incidental ingestion occurs.

The following data gaps were identified based on the results of the baseline risk assessment:

- Subsurface soil samples should be collected from the unrestricted school property. At least one subsurface soil sample should be analyzed for full scan TCL/TAL parameters.

- Confirmatory analyses may be required for the surface soil sample locations with lead concentrations between 200 and 400 mg/kg.
- There are residential properties within the site that have not been sampled. These properties should be sampled, particularly ones in areas with chemical detections that exceed RGOs.
- Additional groundwater samples should be collected at the site to confirm the presence or absence of site-related chemicals of potential concern.

1.0 Introduction

1.1 Overview of Risk Assessment

1.1.1 General Problem

The former Brown's Dump site (hereinafter referred to as "the site") is an approximately 50-acre area located north of West 33rd Street, west of Pearce Street, and south and east of Moncrief Creek in Jacksonville, Duval County, Florida. From 1949 to 1953, the site was an operating landfill used to deposit ash from the City of Jacksonville municipal solid waste incinerator. Additionally, Clinton Brown, former property owner, stated that when the incinerator was not functioning, municipal waste was brought directly to the site (EMCON, 1995). Mr. Brown further noted that the site was used as a hog farm before and after the dumping, and a portion of the dump was used as a vegetable garden (EMCON, 1995).

In 1955, approximately 14 acres of the site were obtained by the Duval County School Board, and the Mary McLeod Bethune Elementary School was built (EMCON, 1995). Approximately 2 acres were acquired by the Jacksonville Electric Authority (JEA) to construct an electrical substation (EMCON, 1995). The site is currently also occupied by several single- and multiple-family residences. Two apartment buildings are located in the area, the Bessie Circle Apartments and the Moncrief Village Apartments.

Ash is present within the 50-acre area at depths varying from the surface to 22 feet below ground surface. The deepest ash is present within the School Board and JEA property, with relatively less deep ash presence in the residential areas. Although ash varies in color, it is identified by the presence of glass and metal fragments and it is generally present at thicknesses of several inches to several feet across the site (EMCON, 1996). The boundaries of the ash are unclear; however, it is visible in the area underneath the school property, the Bessie Circle neighborhood, residences along Pearce Street, and the electrical substation.

The U.S. Environmental Protection Agency (EPA) first assessed ash sites in Jacksonville in 1985. Two incinerator sites (Forest Street and 5th & Cleveland Incinerator) and two disposal sites (Brown's Dump and Lonnie C. Miller, Sr. Park) were found to contain similar ash from incineration facilities that burned similar municipal waste streams. The incineration process generated an ash residue, which sometimes contained significant levels of lead, heavy metals, and other contaminants. Incineration processes can also produce dioxin constituents as a result of incomplete combustion.

Previous investigations at the Brown's Dump site show that concentrations of lead, the main contaminant of concern, range from less than 400 milligrams per kilogram (mg/kg) (the EPA screening level for residential soils) to 78,000 mg/kg.

On September 1, 1999, the City of Jacksonville entered into a Consent Order with EPA to conduct a Remedial Investigation/ Feasibility Study (RI/FS). The EPA, under the authority of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), tasked Black & Veatch Special Project Corp. (Black & Veatch) to conduct oversight of the RI/FS activities and perform the baseline human health and ecological risk assessment for the site. Black & Veatch prepared this baseline risk assessment under Contract Number 68-W-99-043 with EPA Region 4 and under specific authorization of EPA Region 4 through Work Assignment Number 007-RSBD-A496.

This report addresses the human health risk assessment only. The ecological risk assessment is contained in a separate report.

1.1.2 Objectives of Risk Assessment

This baseline risk assessment evaluates the potential risks to human health and the environment due to chemical releases at the Brown's Dump site. The main objective of the baseline risk assessment is to provide the information necessary to assist in the decision-making process at remedial sites. The specific objectives of the baseline risk assessment are to:

- Identify and analyze baseline risks (defined as risks that might exist if no remediation or institutional controls were applied at the site) and help determine what action is needed at the site.
- Provide a basis for determining the levels of chemicals that can remain onsite and still not adversely impact public health.
- Provide a basis for comparing potential health impacts of various remedial alternatives.

The baseline risk assessment results document the magnitude of potential risk at the site and associated cause(s) of that risk. The results will also be used to establish any remedial goal options that may be necessary, help determine what, if any, remedial response actions may be necessary, and assist in establishing the remediation goals that will be presented in the feasibility study.

1.2 Site Description

The former Brown's Dump site occupies an approximately 50-acre area located north of West 33rd Street, west of Pearce Street, and south and east of Moncrief Creek in Jacksonville, Florida. The site is occupied by the Mary McLeod Bethune Elementary School, located at 4330 Pearce Street, a JEA electrical substation, and several single- or multiple-family residences.

The school, which occupies about 14 acres, is primarily covered by grass, pavement, three school buildings, and a parking lot. A few bare areas of soil/ash are present in the grassy area west of the school. A playground, located near the southwest corner of the property, is covered with rubber shavings from old tires. Portions of the courtyard are covered by pine bark. The teacher's parking lot on the eastern portion of the school property is unpaved, and ash is apparent at the surface. The school property is fenced; however, there are breeches in the fence along the west property line.

The JEA electrical substation, which occupies approximately 2 acres, is entirely fenced and covered by grass and gravel.

EPA conducted a Preliminary Assessment in 1985 and concluded that the site should be inspected on a low-priority basis. In November 1985, the EPA Environmental Services Division conducted a Site Screening Investigation and found elevated levels of lead in surface and subsurface soil samples. EPA collected additional samples during a 1995 investigation, which confirmed the lead contamination. EPA advised school officials to restrict access to the contaminated areas as identified by the most recent sample results (EPA, 1995).

In November 1995, EMCON Corporation prepared a Contamination Assessment Report (CAR) for the City of Jacksonville Solid Waste Division. The CAR concluded that several interim remedial actions should be taken at the site and that a health risk evaluation was necessary to evaluate the current and potential future health impacts associated with the site. The 1996 health evaluation concluded that the hazard posed by the Brown's Dump site was not great enough to warrant soil removal.

EPA conducted an Expanded Site Inspection (ESI) in 1998. Surface soil, sediment, surface water, and groundwater samples were collected to characterize the nature of contamination at the site. The ESI concluded that further action was warranted at the site.

1.3 Scope of the Baseline Risk Assessment

The scope of this baseline risk assessment is to evaluate the potential risks to human health resulting from exposure to chemicals of potential concern in soil (surface and subsurface), surface water, sediment, and groundwater associated with the site. No attempt has been made to differentiate between the risk contributions from other sites and those being contributed from the Brown's Dump site. This baseline risk assessment has been derived primarily from the data collected during the April through August 2000 RI field investigation, Expanded Site Inspection (Tetra Tech EM, Inc., 1998), and the Contamination Assessment Report (EMCON, 1995).

The procedures followed in this risk assessment are consistent with, and based on, EPA guidance procedures and policies for the performance of risk assessments at hazardous waste sites:

- U.S. Environmental Protection Agency (EPA), Interim Final Risk Assessment Guidance for Superfund - Human Health Evaluation Manual (Part A) (EPA, 1989).
- U.S. EPA, Interim Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) (EPA, 1998).
- U.S. EPA, Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment (EPA, 1995a).
- U.S. EPA, Integrated Risk Information System (IRIS) (EPA, 2000a).
- U.S. EPA, Exposure Factors Handbook (EPA, 1997a).
- U.S. EPA, Health Effects Assessment Summary Tables (HEAST) (EPA, 1997b).
- U.S. EPA, Soil Screening Guidance (EPA, 1996b).
- U.S. EPA, Supplemental Guidance: "Standard Default Exposure Factors (EPA, 1991).
- U.S. EPA, Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure (EPA, 1993).
- ATSDR, Toxicological Profile For Lead, Update, PB/99/166704 (ATSDR, 1999).

EPA Region 4 guidance was given preference over federal EPA guidance where required. Other specific documents were referenced in the report where relevant.

1.4 Organization of the Baseline Risk Assessment Report

The human health baseline risk assessment for the Brown's Dump site consists of the following:

- Data Collection and Evaluation
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization
- Remedial Goal Options (RGOs)
- Tables

1.4.1 Data Collection and Evaluation

This step in the risk assessment process involves gathering and analyzing the site data relevant to human health and identifying the contaminants present at the site that will be included in the risk assessment process (EPA, 1989).

Analytical data collected during the RI field investigation (conducted between April and August 2000), the Expanded Site Inspection (Tetra Tech EM, Inc., 1998), and the CAR (EMCON, 1995) were used in this baseline risk assessment. Black & Veatch utilized these data to develop analytical summary tables which include statistical information about the chemicals detected in each medium. Using approved screening criteria, a list of the chemicals of potential concern (COPCs) was developed for each medium (EPA, 1995a). Uncertainties associated with data evaluation and selection of COPCs were also discussed in this subsection. Data evaluation and selection of COPCs are performed in Section 2 of this report.

1.4.2 Exposure Assessment

An exposure assessment is conducted to estimate the magnitude of actual (current) and potential (future) human exposures to site media, the frequency and duration of these exposures, and the pathways that result in human exposures. In the exposure assessment, conservative estimates of exposure are developed for both current and future land-use assumptions. Current exposure estimates are used to determine if a threat exists based on existing exposure conditions at the site. Future exposure estimates are to provide decision-makers with an understanding of potential exposure pathways and their associated threats. Conducting the exposure assessment involves analyzing contaminant releases; identifying exposed populations; identifying all the potential pathways of exposure; estimating exposure point concentrations for specific pathways; estimating contaminant intakes for specific pathways; and outlining the uncertainties associated

with this process. The results of the exposure assessment are pathway-specific intakes of chemicals at the site under current and future exposure scenarios (EPA, 1989). The exposure assessment is presented in Section 3 of this report.

1.4.3 Toxicity Assessment

The toxicity assessment determines the types of adverse health effects associated with chemical exposures, the relationship between magnitude of exposure and adverse effects, and the related uncertainties involved. Risk assessments rely heavily on existing toxicity information developed for specific chemicals. The two primary sources for this information are the Integrated Risk Information System (IRIS) database and the Health Effects Assessment Summary Tables (HEAST). The toxicity component in a risk assessment falls into two categories; those related to noncarcinogenic hazards and those related to carcinogenic risks. To evaluate noncarcinogenic hazards, the intake of a chemical is compared to the corresponding reference dose (RfD) of that compound. The RfD used in the risk assessment is a best estimate of the level at which there will be no observed adverse effects to the exposed population. To evaluate carcinogenic risks, the intake of a chemical is factored with the slope factor (SF) for that contaminant. The SF used in the risk assessment represents the 95 percent upper confidence limit (UCL) for the best estimate of the carcinogenic potency of a compound, or its ability to cause cancers in an exposed population. For humans, both the RfDs and Sfs are usually derived from animal dose-response relationships and sometimes human epidemiology studies (EPA, 1989). The toxicity assessment is presented in Section 4 of this report.

1.4.4 Risk Characterization

The risk characterization section of the risk assessment summarizes and combines the exposure and toxicity assessments to characterize baseline risks, both quantitatively and qualitatively. During risk characterization, chemical-specific toxicity information is compared with the estimated exposure levels to determine whether chemicals at the site pose current or future risks that are of a magnitude to cause concern. This subsection includes an uncertainty analysis that shows that the calculated risks are relative in nature and do not present an absolute quantification. The risk characterization is presented in Section 5 of this report.

1.4.5 Remedial Goal Options

RGOs for human receptors are presented based on the site-specific results of the risk characterization. The RGO subsection of the human health risk baseline risk assessment contains an appropriate narrative and media cleanup levels for each contaminant of concern in each land-use scenario evaluated. Chemicals of concern are chemicals that significantly contribute to a use scenario for a receptor that exceeds a 10^{-4} total carcinogenic risk or exceeds a hazard index (HI) of 1 (EPA, 1995a). Individual chemicals

contributing to these pathways did not have RGOs developed if their contribution was less than 10^{-6} risk for carcinogens or a hazard quotient (HQ) less than 0.1 for noncarcinogens. The tables show the 10^{-4} , 10^{-5} , and 10^{-6} risk levels and the 0.1, 1, and 3 hazard quotient levels for each applicable chemical in each medium (EPA, 1995a).

In cases where applicable or relevant and appropriate requirements (ARARs) have been developed for specific chemicals of concern, a comparison between these ARARs and estimated exposure levels is made.

RGOs are presented in Section 6 of this report.

1.4.6 Tables

All tables for the human health risk assessment are in Appendices A, B, and C.

2.0 Data Collection and Evaluation

This step in the risk assessment process involves gathering and analyzing the site data relevant to the human health evaluation and identifying the chemicals present at the site that will be included in the risk assessment process (EPA, 1989). The objectives of this subsection are to review and summarize the analytical data for each medium sampled at the Brown's Dump site and to select the chemicals of potential concern to be evaluated in the human health risk assessment.

2.1 Evaluation

Contamination at the site was characterized by multimedia sampling during the 1997 ESI and the 2000 RI field investigation. During the ESI, 16 surface soil, four surface water, four sediment, and four groundwater samples were collected from locations across the former Brown's Dump site. All samples collected were analyzed for all organic parameters listed in the Target Compound List (TCL) and all inorganic parameters listed in the Target Analyte List (TAL). In addition, surface soil samples were analyzed for dioxin/furan compounds. According to the Preliminary Site Characterization Report for the Brown's Dumps Site (CH2M Hill, 2000), four types of environmental samples were collected and analyzed from the site during the RI:

| Media | XRF | Lead Only | TAL | TCL | Dioxin Screen | Dioxin Lab |
|---------------|-------|-----------|-----|-----|---------------|------------|
| Soil | 1,198 | 7 | 144 | 42 | 42 | 13 |
| Ground-water | NA | 10 | 16 | 20 | 0 | 4 |
| Surface Water | NA | 0 | 16 | 16 | 0 | 0 |
| Sediment | 0 | 0 | 8 | 8 | 2 | 0 |

NA = Not Applicable

XRF = X-Ray fluorescence

Sampling locations for the ESI and RI are shown on Figures 2-1 through 2-3. This risk assessment is based on data from the ESI and from RI analytical data provided by CH2M Hill on November 13, 2000.

For purposes of the risk assessment, the former Brown's Dump site was divided into two primary areas. Area 1 consists of the land located within the boundary on Figure 2-1. This area contains the elementary school property and a fenced, grassy area. The JEA electrical substation is located inside this fenced area. Area 2 contains all of the surrounding parcels of land (i.e., residences, apartment buildings). To simplify the risk assessment report, only Area 1 is evaluated in the body of this risk assessment report. All risk

assessment tables associated with Area 1 are presented in Appendix A. Area 2 is discussed and evaluated in Appendix B.

As part of the data evaluation, the surface soil analytical data for lead, arsenic, aroclor 1260, carcinogenic polynuclear aromatic hydrocarbons, and dioxins were plotted on a site map to determine if any "hot spots" existed in Area 1 (Figure 2-2). Area 1 was divided into two exposure units based on the distribution of contaminants, current land usage, and site features. These smaller exposure units are likely to denote the areal extent of a receptor's movements during a single day.

Exposure Unit 1 consists of the unrestricted school property and contains seven surface soil samples (Figure 2-1). In December 1995, a sandy soil material capable of sustaining a grass cover was installed across much of EU1. Portions of the courtyard are covered by pine bark. Therefore, surface soil/ash is not currently exposed. Five of the seven samples (BDSS06, BDSS07, BDSS08, BDSS09, and BDSS10) were analyzed for TCL parameters and dioxins/furans. Five samples were analyzed for inorganic parameters on the TAL, two samples were analyzed for cyanide, and one sample, BDSB084, was analyzed for lead only. One result for both antimony and arsenic was rejected and not used in the risk assessment. In this exposure unit, detected concentrations of PCBs and benzo(a)pyrene were highest in surface soil sample BDSS10. This sample was collected from the playground area.

Exposure Unit 2 consists of the currently restricted area located immediately north of the school and contains six surface soil samples (Figure 2-1). Three of the six samples (BDSS12, BDSS15, and BDSB079) were analyzed for volatile organic compounds, (BDSS79 was the only sample analyzed for xylene and cyanide), TAL parameters, and dioxins/furans. Two samples (BDSS12 and BDSS15) were analyzed for semivolatile organic compounds. The remaining three samples (BDSB080, BDSB082, and BDSB083) were analyzed for lead only. In Exposure Unit 2, the maximum detected concentration of each COPC was detected in either surface soil sample BDSS12 or BDSS15 (Figure 2-2).

Sediments that are covered by surface water are likely to be washed off of body surfaces before significant exposures occur. According to EPA Region 4 guidance (EPA, 1995a), it is generally unnecessary to evaluate exposure to sediments covered by water; however, sediments in intermittent streams should be considered as surface soil for the portion of the year that the stream is without water. All sediment sampling locations at the Brown's Dump are covered by surface water; therefore, human exposures to sediment in Moncrief Creek were not quantitatively evaluated in this baseline risk assessment. However, exposure to sediment was evaluated in the ecological risk assessment.

Finally, as part of the detailed evaluation of the analytical data, any analytical data with “R” qualifiers were eliminated from further consideration in the baseline risk assessment (EPA, 1989). “R” qualified data is rejected and should not be used (EPA, 1989). Also, common laboratory contaminants (acetone, methylene chloride, phthalates and 2-butanone) were eliminated from further consideration if the detected concentration did not exceed ten times the maximum blank concentration (EPA, 1989). The “uncommon” laboratory contaminants (all other chemicals on the TCL) were eliminated if the detected concentration was not five times greater than the maximum amount detected in any blank (EPA, 1989). Any duplicate samples that were collected during the field investigation were averaged to reduce the bias introduced when more than one sample was collected from any one location.

Table 1 (located in Appendix A) outlines the receptors, exposure pathways, and exposure routes that were evaluated in this baseline risk assessment.

2.2 Selection of Chemicals of Potential Concern

COPCs are a subset of all chemicals positively identified at the site. The risks associated with the COPCs are expected to be more significant than the risks associated with other less toxic, less prevalent, or less concentrated chemicals at the site that are not evaluated quantitatively. The process of determining the COPCs for the Brown’s Dump site included a detailed evaluation of the analytical data, a careful analysis of the sources of contamination and areas that the sources impact, and a review of site characteristics.

Tables 2.1 through 2.5 list all chemicals that have been detected in at least one sampling location from the following media: surface soil, subsurface soil, surface water, and groundwater. Sampling locations from these environmental media are presented in Figures 2-1 through 2-3. In accordance with RAGS Part D, Tables 2.1 through 2.5 also contain statistical information about the chemicals detected in each medium, the detection limits of chemicals analyzed, risk-based screening values for COPC selection, and the chemicals selected or deleted as COPCs. In accordance with EPA Region 4 guidance (EPA, 1995a), the following screening criteria were used to select or eliminate each chemical:

1. For surface and subsurface soil data, concentrations of detected chemicals were compared to the EPA Region 9 Preliminary Remediation Goals (PRG) for residential soil (EPA, 2000c). If the maximum detected concentration was less than a carcinogenic risk level of 1×10^{-6} or hazard quotient of 0.1, the chemical was eliminated from the COPC list (EPA,

1995a). The Florida Soil Cleanup Target Level (SCTL) was used as the screening criterion if it was lower than EPA's PRG.

2. For surface water data, the maximum detected concentration was compared to the Water Quality Standard for human health (consumption of water and organisms) (EPA, 1999b). If the maximum detected concentration was less than the screening level, the chemical was eliminated as a COPC for human exposure.
3. For groundwater data, concentrations of detected chemicals were compared to the EPA Region 9 PRGs for tap water (EPA, 1995a). If the maximum detected concentration was less than a carcinogenic risk level of 1×10^{-6} or hazard quotient of 0.1, the chemical was eliminated from the COPC list (EPA, 1995a). The Florida Groundwater Cleanup Target Level (GCTL) was used as the screening criterion if it was lower than EPA's PRG. Inorganic chemicals were eliminated if the maximum detected concentration was less than two times the mean background concentration (EPA, 1995a).
4. Inorganic chemicals were eliminated from further consideration if the chemical is considered to be an essential nutrient and have relatively low toxicity (i.e., calcium, magnesium, potassium, and sodium) (EPA, 1995a).

The constituents retained as COPCs for surface soil, subsurface soil, surface water, and groundwater are listed below.

- **Surface Soil (Exposure Unit 1):** antimony, aroclor 1260, arsenic, barium, carcinogenic polynuclear aromatic hydrocarbons (PAHs), copper, dioxins, iron, and lead.
- **Surface Soil (Exposure Unit 2):** antimony, aroclor 1260, arsenic, barium, cadmium, carcinogenic PAHs, chromium, copper, dieldrin, dioxins, iron, lead, manganese, vanadium, and zinc.
- **Subsurface Soil (Exposure Unit 1):** Only two subsurface soil samples were collected in Exposure Unit 1. These samples were analyzed for lead only using XRF methodology. All the lead results for these samples were nondetect; therefore, there are no COPCs for subsurface soil in this exposure unit.
- **Subsurface Soil (Exposure Unit 2):** aluminum, antimony, arsenic, barium, cadmium, chromium, carcinogenic PAHs, copper, dioxins, iron, lead, manganese, and vanadium.

- **Surface Water:** aluminum, arsenic, barium, chromium, iron, and manganese.
- **Groundwater:** aldrin, aroclor 1016, arsenic, gamma-chlordane, DDE, heptachlor, heptachlor epoxide, iron, and manganese.

2.3 Uncertainties Associated With Data Evaluation

The purpose of data evaluation is to determine which constituents, if any, are present at the site at concentrations requiring further investigation. The screening process used to select COPCs to evaluate in the baseline risk assessment was intended to include all chemicals with concentrations high enough to be of concern for the protection of public health.

Uncertainty with respect to data evaluation can arise from many sources, such as the quality and quantity of the data used to characterize the site, the process used to select data to use in the risk assessment, and the statistical treatment of data.

2.3.1 Data Quantity and Quality

All samples collected during the ESI were analyzed for TCL/TAL parameters. In addition, surface soil samples were analyzed for dioxin/furan compounds. All soil samples collected during the RI were analyzed for lead, and varying percentages of the samples were analyzed for TCL, TAL, and dioxin/furan compounds. All groundwater and surface water samples were analyzed for TCL/TAL parameters. Organic compounds, consisting of carcinogenic PAHs, pesticides, aroclor compounds, and dioxins (in soil only), were detected and retained as COPCs in the environmental media at the site. It is possible that organic compounds may have been present at higher concentrations in soil samples that were not analyzed for TCL or TAL parameters. This may lead to an underestimation of risk.

A total of 1,198 soil samples were analyzed for lead in the field using XRF. One hundred and twenty-three of these samples were also submitted to a laboratory for confirmatory analysis. Of the 123 samples that had both XRF and laboratory results, 23 percent (28 samples) had the same results, 61 percent (75 samples) had lab results greater than the corresponding XRF readings, and 16 percent (20 samples) had XRF readings greater than the corresponding lab results.

The XRF and laboratory readings were different for 95 samples. For these samples, the higher result was generally between 1.2 and 1.9 times greater than the lower number (70 of the 95 samples fell in this category). For example, sample BDSBO36 had an XRF reading of 64.7 mg/kg and a laboratory reading

of 90 mg/kg. For this sample, the laboratory result was 1.4 times higher than the XRF reading (i.e., 90/64.7 is equal to 1.4).

The comparison of the results for these 95 samples is presented below.

| Difference Between Lab and XRF Reading | Number of Lab Results That Were Higher Than XRF Results | Number of XRF Results That Were Higher Than Lab Results |
|---|--|--|
| 1.2 - 1.9 X | 53 | 17 |
| 2.0 - 2.9 X | 16 | 2 |
| 3.0 - 3.9 X | 2 | 0 |
| 4.0 - 4.9 X | 1 | 0 |
| 5.0 - 5.9 X | 1 | 0 |
| 6.0 - 6.9 X | 1 | 0 |
| 7.0 - 7.9 X | 0 | 0 |
| 8.0 - 8.9 X | 0 | 0 |
| 9.0 - 9.9 X | 1 | 0 |
| > 10 X | 0 | 1 |
| TOTALS | 75 | 20 |

When two results were reported for a sample (an XRF and a laboratory result), the higher of the two results was used in the risk assessment. However, since most samples were only analyzed by XRF, the reported results may underestimate the concentrations of lead at the site.

Since XRF data are likely to underestimate the concentrations of lead at the site, EPA expects XRF measurements between 200 mg/kg and 400 mg/kg to be confirmed by laboratory analysis. To ensure that XRF lead measurements below 200 mg/kg are not actually above 400 mg/kg (the threshold of concern for lead), EPA further evaluated the XRF and laboratory data for lead. The evaluation indicated an error of 1.7 percent when XRF lead measurements under 200 mg/kg were compared with corresponding fixed laboratory analytical lead measurements exceeding 400 mg/kg. In other words, 98.3% of XRF samples with less than 200 mg/kg lead also show a lead concentration from a fixed laboratory less than 400 mg/kg, the risk based remedial goal option for lead.

CH2MHill used XRF to screen for lead in the surface soil in the playground area of the school. The screening assessment was conducted to ensure that interim actions that were instituted in December 1995 were still effective. All samples in this area were below 400 mg/kg. These data were not used in the risk

assessment. This may result in an overestimation of lead concentrations in Exposure Unit 1.

The highest detected concentration of dieldrin in surface soil was flagged by the laboratory with a "N" qualifier. This value was retained in the baseline risk assessment to be protective. However, this adds uncertainty to the risk assessment because the "N" flag means that dieldrin was only tentatively identified at soil sample location BDSS07 (0.0078 N mg/kg) (Exposure Unit 1) (EPA, 1989).

Fifty-three dioxin samples were analyzed in the field by Draft Screening Method 4425. Nine samples (eight surface soil and one subsurface soil) were submitted to a laboratory for confirmatory analysis. Only the dioxin samples that were sent to the laboratory were used in the baseline risk assessment. Samples that were analyzed in the field were not used in the baseline risk assessment because of uncertainty associated with the analytical method. This may lead to an under- or overestimation of risk.

A limited number of groundwater samples have been collected at the Brown's Dump site to date. Detected concentrations of COPCs in these few samples may result in an under- or over-estimation of risk. In accordance with EPA Region 4's Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM), all groundwater samples collected during the RI had nephelometric turbidity unit (NTU) readings of 10 or less. However, the turbidity readings in the groundwater samples collected during the ESI ranged from 15 to 16 NTUs. Also, the turbidimeter malfunctioned at two sampling locations during the ESI; therefore, turbidity readings were not obtained for these groundwater samples. Highly turbid samples may contain elevated concentrations of inorganic constituents. In general, groundwater samples collected during the ESI contained concentrations of metals that were approximately 1,000 times higher than those collected during the RI. Therefore, the risk assessment concluded that the ESI results for the inorganic constituents may be inaccurate because of turbidity and the results were excluded from the risk assessment (analytical results for the organic compounds were included in the risk assessment). This may lead to an underestimation of risk from exposure to groundwater.

Inorganic soil and water samples at the Brown's Dump site were analyzed using Trace Inductively Coupled Plasma (ICP). However, EPA Region 4 has determined that using ICP for low levels of arsenic, selenium, and thallium analyses may result in false positive results. Therefore, any future lab analyses should use an alternative analytical method such as Inductively Coupled Plasma - Mass Spectroscopy (ICP-MS) to achieve lower detection limits.

2.3.2 Exposure Units

The surface and subsurface soil data were divided into two exposure units. The exposure units were grouped based on contaminant distributions and current usage. A given individual is assumed to be exposed to only one of the exposure units. Depending on actual site uses and human activities, these groupings may result in an over- or underestimation of risk.

2.3.3 Elimination of Sediment Data

Human exposures to sediment were not quantitatively evaluated in this risk assessment since the sediment samples were collected from areas that are always covered by water (i.e., Moncrief Creek). This may result in an underestimation of risk. However, as noted in Section 2.1, sediment data were evaluated in the ecological risk assessment for the site.

3.0 Exposure Assessment

3.1 Overview of Exposure Assessment

The objective of the exposure assessment is to estimate the types and magnitudes of exposures to chemicals of potential concern that are present at or migrating from the site. The results of the exposure assessment are combined with chemical-specific toxicity information to characterize potential risk (EPA, 1989). The assessment of exposures presented in this section is based upon and consistent with current EPA guidance.

The purpose of the exposure assessment is to estimate the magnitude of potential human exposure to the chemicals of potential concern at the Brown's Dump site. The results of the exposure assessment are subsequently combined with chemical-specific toxicity information to quantitatively estimate the potential human health risks associated with chemical exposure.

The exposure assessment process involves four main steps:

- Characterization of the exposure setting.
- Identification of the exposure pathways.
- Quantification of the exposure.
- Identification of uncertainties in the exposure assessment.

3.2 Characterization of the Exposure Setting

3.2.1 Physical Setting

3.2.1.1 Demography and Land Use. The former Brown's Dump site is an approximately 50-acre area located north of West 33rd Street, west of Pearce Street, and south and east of Moncrief Creek in Jacksonville, Duval County, Florida. From 1949 to 1953, the site was an operating landfill that was used to deposit ash from the City of Jacksonville municipal solid waste incinerator. In 1955, approximately 14 acres of the site were obtained by the Duval County School Board, and the Mary McLeod Bethune Elementary School was built (EMCON, 1995). Approximately 2 acres were acquired by the JEA to construct an electrical substation (EMCON, 1995). The site is currently also occupied by several single- and multiple-family residences. Two apartment buildings are located in the area, the Bessie Circle Apartments and the Moncrief Village Apartments.

In 1990, the population in Jacksonville was 906,727. It is estimated that the Jacksonville population increased to 1,044,684 by 1998 (U.S. Census Bureau, 1999). According to the 1990 U.S. Census,

approximately 3,939 people (6 percent Caucasian, 90 percent African-American, and 1.5 percent Hispanic) live within ½ mile of the site. Approximately 16 percent of the population is under the age of 9, and 18 percent of the population is over the age of 65. Approximately 48 percent of the population over age 25 graduated from high school. Approximately 37 percent have less than a ninth grade education. The median family income is about \$17,814. Approximately 85 percent of the housing units are occupied (CH2MHill, 2000).

The economy of Jacksonville is based primarily on wholesale and retail trade, and manufacturing. The largest sectors of the wholesale and retail markets are motor vehicles and motor vehicle parts. Products manufactured in the Jacksonville area include many different types of food, beverages, tobacco products, paper, chemicals, fabricated metal products, medical equipment and supplies, and nonmetallic mineral products. The finance and insurance industry also contributes significantly to the economy of Jacksonville. The major sources of finance and insurance income are insurance carriers and credit intermediation (U.S. Census Bureau, 1997).

3.2.1.2 Water Uses. The geology in the Jacksonville area can be divided into three hydrostratigraphic units: the surficial aquifer system, the intermediate aquifer/confining unit, and the Floridan aquifer system.

The surficial aquifer system sediments are 50 to 100 feet thick in Duval County. The water table is found between 1 and 10 feet below land surface (bls). Recharge to the water-table zone is primarily from local rainfall. The water-table zone of the surficial aquifer system is used for limited irrigation, stock, and domestic uses. The “Rock” limestone aquifer is the major water-yielding zone in the surficial aquifer system and is tapped by numerous private and small community supply wells in Duval County. Well yields from the limestone unit average 30 to 100 gallons per minute (gpm) with peaks as high as 200 gpm. Water level elevations of the water table zone and the limestone unit are similar; however, when water levels in the water table aquifer are higher than those of the limestone unit, a downward potential, albeit small, may exist.

The surficial aquifer system is underlain by the intermediate aquifer system/confining unit, which is between 250 to 500 feet thick. Wells in this zone will yield at least 20 gallons per minute.

The Floridan aquifer system is the principal source of fresh water in the area and is found under artesian conditions between 500 to 550 feet bls in the Jacksonville area. Regional flow direction within the Floridan aquifer system is to the east-northeast. The city of Jacksonville municipal water supply system is derived

from wells that tap the Floridan aquifer system 1,000 to 1,500 feet deep. Due to its considerable thickness, low permeability, and high potentiometric surface elevation, generally no recharge of the Floridan aquifer system takes place in the Jacksonville area.

Potable water within a 4-mile radius of the site is provided by the Jacksonville Public Utilities (JPU) water well system, and community and private wells. The JPU provides potable water to approximately 410,000 residents. The closest JPU well is located approximately 2,200 feet south of the site (USGS, 1992). Magnolia Gardens, a small community water system, maintains one well which serves approximately 1,790 residents (Black & Veatch, 1995). Lake Forest, a second community water system, also maintains one well serving approximately 2,135 residents (Black & Veatch, 1995). All municipal wells are screened in the Floridan aquifer (Black & Veatch, 1995).

Private well usage in the study area was obtained through a U.S. Bureau of the Census study compilation report (Tetra Tech, 1998). There are approximately 911 residents obtaining potable water from private wells located within a 1-mile radius of the site (Tetra Tech, 1998). None of the wells has been sampled and analyzed for site-related constituents.

Surface drainage in the study area generally flows northward overland into Moncief Creek, located immediately north of the site. Moncief Creek flows into Trout River, located approximately 2 ½ miles northeast of the site, and eventually into the St. Johns River. There are no known surface water intakes along the surface water pathway. Moncief Creek, Trout River, and St. Johns River are all designated recreational fishing areas (Tetra Tech, 1998).

3.2.1.3 Climatology. Duval County has a humid, subtropical climate. The mean annual temperature is approximately 69 °F. The mean monthly temperatures for the warmest month (July) and coldest month (January) are approximately 82.6 °F and 55.9 °F, respectively. The annual rainfall averages about 54 inches. However, as a result of local thunderstorms, rainfall amounts vary from place to place within the county. The majority of rainfall (60-70 percent) occurs between June and October. The average wind speed in the Jacksonville area is 7.9 miles per hour (mph) with maximum wind speeds of 57 mph in July.

3.2.1.3.1 Dispersion climatology. The dispersive capacity of the atmosphere is of primary interest when estimating the potential for the atmospheric migration of site emissions from contaminated surface soil. As on-site meteorological monitoring was not within the scope of the RI, the following paragraphs contain

a qualitative assessment of the potential to inhale emissions of COPCs from contaminated surface soil at the Brown's Dump site.

It is possible that site-related COPCs may be released to the air from contaminated surface soil via two mechanisms: (1) volatilization of organic compounds and (2) particulate emissions during wind erosion events.

Organic compounds are divided into two categories - volatile organic compounds and semivolatile organic compounds. Of these two categories, volatile organic compounds (VOCs) will volatilize the most readily. However, no VOCs were detected in the surface soil at the site; therefore, transport via volatilization is not considered significant at the site.

Entrainment in dust can be a transport mechanism for inorganic and organic compounds (e.g., pesticides, PCBs). With the exception of a few small patches of bare soil/ash, Exposure Units 1 and 2 are vegetated, paved, or covered with some other material (e.g., gravel, pine bark). Such surfaces require high threshold wind speeds (wind speeds of approximately 22 mph) for wind erosion to occur, and particulate emission rates tend to decay rapidly during an erosion event (EPA, 1985). Since the average wind speed for the Jacksonville area is only 7.9 mph, it is unlikely that exposure via inhalation of fugitive dusts would present a significant exposure pathway.

No VOCs were retained as COPCs in subsurface soil. Further, it was assumed that soil would be vegetated if subsurface soil was brought to the surface in the future.

Based on the above discussion, it was assumed that volatile or particulate emissions from soil in Exposure Units 1 and 2 would not constitute a significant exposure pathway under current or future exposure conditions. Therefore, the inhalation of VOCs and particulate emissions from soil was not quantitatively evaluated in the baseline risk assessment.

3.2.2 Potentially Exposed Populations

The former Brown's Dump site is a residential community that consists of several single and/or multiple family homes and an elementary school. The school is covered by grass, pavement, three school buildings, and a parking lot. Moncrief Creek bisects the northern portion of the site. Access to the school property is unrestricted; however, some restrictive fencing has been used to limit access to areas of known contamination (Tetra Tech EM, Inc., 1998).

The risk assessment conservatively assumed that current and future use of the school property (Exposure Unit 1) and the restrictive area north of the school (Exposure Unit 2) is residential. This assumes that children attending Mary McLeod Bethune Elementary School live at a nearby home that is also part of the former Brown's Dump site. Therefore, it was assumed that current and future residents may be exposed to COPCs in surface soil in Exposure Units 1 and 2. Current and future residents may also be exposed to site-related chemicals during recreational activities by having direct contact with contaminated surface water in Moncrief Creek. Also, the future resident was assumed to be exposed to subsurface soil brought to the surface during construction or renovation activities. Future residents may also be exposed to groundwater if a private well is installed.

3.3 Identification of Exposure Pathways

The Brown's Dump site operated from 1949 until it was closed in 1953 as a landfill for incinerator ash. Several environmental investigations have been conducted at the site since 1985. Elevated levels of lead and 2,3,7,8-tetrachlorodibenzodioxin have been detected in surface and subsurface soil. Aluminum, arsenic, barium, cadmium, calcium, cobalt, copper, iron, lead, magnesium, nickel, potassium, sodium, vanadium, and zinc have been detected in the groundwater at the site. Mercury and lead have been detected in sediment samples collected from Moncrief Creek.

This human health risk assessment quantitatively evaluates potential risks from exposure to COPCs in surface and subsurface soil, surface water, and groundwater. Exposure to sediment by ecological receptors will be evaluated in the ecological risk assessment.

3.3.1 Exposure Pathway Analysis

The conceptual site model for the Brown's Dump site (Figure 3-1) incorporates information on the potential chemical sources, affected media, release mechanisms, routes of migration, and known or potential human receptors. The purpose of the conceptual site model is to provide a framework with which to identify potential exposure pathways occurring at the site. Information presented in the ESI Report, PA/SI Report, and data collected during a site visit conducted on December 20, 1999, were used to identify potential receptors and exposure pathways at the site.

An exposure pathway consists of four elements: (1) a source and mechanism of chemical release; (2) a retention or transport medium (or media in cases involving media transfer of chemicals); (3) a point of potential human contact with the contaminated medium; and (4) an exposure route (i.e., ingestion) at the contact point (EPA, 1989). When all of these elements are present, the pathway is considered complete.

The assessment of pathways by which human receptors may be exposed to COPCs includes an examination of existing migration pathways (e.g., soil) and exposure routes (e.g., ingestion, dermal absorption), as well as those that may be reasonably expected in the future.

Surface and subsurface soil is believed to be the major source of potential exposure to human receptors, followed by groundwater, and surface water.

3.3.1.1 Soil. The risk assessment evaluated six surface soil and two subsurface soil samples in Exposure Unit 1. The subsurface soil samples were analyzed for lead only using XRF methodology. The lead results for these samples were nondetect; therefore, there were no COPCs for subsurface soil in Exposure Unit 1. Six surface soil samples and three subsurface soil samples were analyzed in Exposure Unit 2.

A current/future resident may be exposed to COPCs in surface soil as well as subsurface soil that is brought to the surface during construction or renovation activities. Therefore, a current/future resident was quantitatively evaluated for exposure to surface and subsurface soil (subsurface soil was quantitatively evaluated in Exposure Unit 2 only).

3.3.1.2 Groundwater. Groundwater beneath the Brown's Dump site became contaminated through leaching of ash. The subsequent infiltration of precipitation resulted in contaminant movement from surface and subsurface soil to groundwater.

A total of 10 groundwater samples were evaluated in the risk assessment. Potable water is currently supplied by JPU; however, a resident may install a private well in Exposure Units 1 or 2 in the future. Therefore, exposure to groundwater was evaluated for the future resident.

3.3.1.3 Surface Water. Surface drainage flows northward into Moncrief Creek, which is located north of the site. Moncrief Creek flows into Trout River, which then eventually flows into the St. Johns River. Three surface water samples (samples BDSW03, BDSW04, and BDSW06) collected from Moncrief Creek were evaluated in the risk assessment. These samples were selected because of their proximity to the site. Current/future residents may be exposed to COPCs in surface water while recreating in Moncrief Creek.

3.3.2 Exposure Scenarios

This narrative discusses the rationale for selection of exposure pathways for both the current and future exposure scenarios. Table 1 outlines the scenarios, exposure pathways, and routes of exposure that were quantitatively evaluated in the baseline risk assessment.

3.3.2.1 Current/Future Resident. As discussed in Subsection 3.2.2, the risk assessment conservatively assumed that current and future use of the school property (Exposure Unit 1) and the restrictive area north of the school (Exposure Unit 2) is residential. Therefore, it was assumed that current and future residents may be exposed to COPCs in surface soil in Exposure Units 1 and 2. Current and future residents may also be exposed to site-related chemicals in surface water. Also, the future resident was assumed to be exposed to subsurface soil brought to the surface during construction or renovation activities. Potential routes of exposure for residents (child and adult) included incidental ingestion of, and dermal contact with, COPCs in soil and surface water.

Some residents may be exposed to site-related COPCs via ingestion of homegrown vegetables. According to residents, the primary vegetables grown in this area are collard greens, tomatoes, and onions. A qualitative discussion of the exposure route is included in Section 5, Risk Characterization.

Future residents may also be exposed to groundwater if a private well is installed. When evaluating exposure to groundwater, EPA Region 4 considers ingestion, and inhalation of and dermal contact with VOCs while showering to be the most significant exposure routes. However, no VOCs were detected in groundwater at the former Brown's Dump site; therefore, the risk assessment assumed that ingestion of groundwater represented the most significant exposure route for this medium.

3.4 Quantification of Exposure

The following basic equation was used to calculate human intake of an environmental constituent (EPA, 1989):

$$DI = C \times HIF$$

Where:

DI = Daily Intake (mg of chemical per kg of body weight per day).

C = Concentration of the chemical in mg/kg or milligrams per liter (mg/L) [parts per million (ppm)].

HIF = Human Intake Factor (kg of medium per kg body weight per day).

Each intake variable in the above equation has a range of values. The intake variable values for a given pathway were selected so that the combination of intake variables resulted in an estimate of the reasonable maximum exposure that can be expected to occur (EPA, 1989). This section describes the method by which the exposure concentrations and the human intake factors were derived.

3.4.1 Exposure Point Concentrations

The concentration term used in the intake equations is an upper bound estimate of the arithmetic average concentration for a chemical of potential concern based on a set of site sampling results. Ideally the exposure point concentration (EPC) should be the true average concentration within an exposure unit. Due to the uncertainty associated with estimating the true average concentration at a site, the 95 percent UCL of the arithmetic mean is generally used for this variable (EPA, 1989). When the 95 percent UCL exceeds the maximum detected concentration, the maximum detected concentration is used as the EPC.

Sampling data sets with fewer than 10 samples per exposure area provide poor estimates of the mean concentration (i.e., there is a large difference between the sample mean and the 95 percent UCL). All exposure areas evaluated in this risk assessment contained fewer than 10 samples; therefore, the maximum detected concentration was used as the EPC.

EPA Region 4 makes an exception for the use of the UCL as the EPC for groundwater. Groundwater EPCs should be the arithmetic average of the wells in the highly concentrated area of the plume (EPA, 1995a). Therefore, the wells used in the calculation of the groundwater EPCs included: BDMW001, BDMW05, BDMW06, and BDMW005.

There are no approved health criteria for quantifying risk from exposure to lead. Therefore, the Integrated Exposure Uptake Biokinetics (IEUBK) Model for Lead was used to predict mean blood levels in children exposed to environmental media at the site. In accordance with EPA Region 4 guidance, the average detected lead concentrations were used in the model.

Tables 3.1 through 3.5 list the EPCs for surface and subsurface soil, surface water, and groundwater.

3.4.2 Exposure Dose Algorithms and Assumptions

This subsection presents the mathematical models used to calculate the intakes (i.e., doses) of chemicals of potential concern by each receptor through the applicable exposure routes.

Ideally, site-specific exposure information is obtained during a visit to the site. This site-specific information is subsequently used in the baseline risk assessment to provide the most realistic estimate of risks and hazards resulting from potential exposure to contaminated environmental media at the site.

The U.S. EPA has developed exposure algorithms for use in calculating reasonable maximum exposure chemical intakes through the exposure pathways and routes that are relevant for this site. These algorithms combine the chemical EPC with potential pathways and route-specific parameters to produce reasonable maximum exposures that can be expected to occur at the site. Ultimately, these algorithms result in potential daily chemical intakes or doses which are expressed in terms of milligrams of chemical that could be taken into the body per kilogram of body weight per day (mg/kg-day).

The exposure models and assumptions are presented in Table 4.1 through 4.6 (Appendix A). Each table defines the exposure route variables and includes assumptions (i.e., exposure parameters) used in the model for each scenario. Additional information regarding the assumptions is presented in the text. In the absence of site-specific exposure data, EPA's standard default assumptions (EPA, 1991; EPA, 1997a) were used to estimate reasonable maximum exposures for each receptor. EPA Region 4's Supplemental Guidance to RAGS (EPA, 1995a) was used where appropriate.

Daily chemical intakes were calculated for each exposure route applicable to the current/future resident. Daily chemical intakes were estimated separately for potential carcinogenic and noncarcinogenic health effects in accordance with U.S. EPA methodology (EPA, 1989). Noncarcinogenic health effects were evaluated for child residents only. For the child resident scenario, doses were averaged over the number of days of exposure (years of exposure x 365 days/year) to evaluate noncarcinogenic health effects. To evaluate potential carcinogenic health effects (EPA, 1989), doses were averaged over a lifetime (70 years x 365 days/year).

The residential scenarios assumed that individuals live in the same residence for 30 years (EPA, 1995a). In addition, it was assumed that residents take about two weeks of vacation per year, spending 350 days per year at home (EPA, 1995a). Two age groups were evaluated for current/future residential scenarios. These groups included a child (age 1 to 6) and an adult; consequently, exposure durations of 6 and 24 years, respectively, were used. A body weight of 15 kilograms was used for a child while a body weight of 59 kilograms was used for an adult resident (EPA, 2000b).

The following subsection presents the assumptions that were used to calculate the intakes (i.e., doses) of chemicals of potential concern for each receptor through the applicable exposure routes.

3.4.2.1 Incidental Ingestion of Soil. Incidental soil ingestion can result from placing soil-covered hands or objects in the mouth. Soil ingestion is a potential route of exposure for the current/future resident.

The current/future resident was assumed to be exposed to surface soil during outdoor activities, such as yard work or recreational activities. A year-round exposure (350 days per year) to surface soil was assumed (EPA, 1991). It has been estimated that children age 1-6 incidentally ingest 200 mg of soil on a daily basis and that individuals over the age of 6 ingest 100 mg of soil per day (EPA, 1991). Therefore, residential exposure was divided into two age groups to reflect these varying ingestion rates.

The exposure dose model and assumptions for the soil ingestion route are presented in Tables 4.1 and 4.2.

3.4.2.2 Dermal Absorption from Soil. Dermal contact with soil could result in absorption of chemicals through the skin. Dermal absorption of chemicals from soil is a potential exposure route for the current/future resident.

The exposed skin areas that were used to evaluate dermal contact with surface soil and subsurface soil are outlined below:

- Current/Future Adult Resident were assumed to be 25 percent of the 50th percentile total body surface area of an adult male [5,000 square centimeters (cm²)]. This is the recommended value in EPA's Exposure Factors Handbook for adults and outdoor soil (EPA, 1997a).
- Current/Future Child Resident were based on the 50th percentile surface area of the hands, arms, feet, and legs of males age 3-6 (4,000 cm²).

As recommended in the EPA Region 4 Guidance (EPA, 1995a), absorption factors of 1.0 percent and 0.1 percent were used for organics and inorganics, respectively. EPA Region 4 guidance also recommends a range of 0.2 to 1.0 milligrams per square centimeter (mg/cm²) for the soil to skin adherence factor (EPA, 1995a). An adherence factor of 1.0 mg/cm² was used.

The equation and assumptions that were used to calculate absorbed dose are presented in Tables 4.1 and 4.2. As indicated in this table, the exposure frequencies, durations, and body weights for each receptor are the same as those described in Section 3.4.2.

3.4.2.3 Incidental Ingestion of Surface Water. The risk assessment assumed that residents may unintentionally swallow a small amount of surface water while playing or wading in Moncrief Creek. Due to shallow water depths in the vicinity of the site, it was assumed that a resident's exposure to Moncrief Creek would be limited to wading. In the absence of site-specific data for wading, it was assumed that current/future residents were exposed to surface water in Moncrief Creek for 45 days per year (EPA, 1995a).

The amount of water that is ingested is likely to vary considerably, depending on the behavioral patterns of the individual. Some individuals may not ingest any water, while others may drink directly from the creek. In the absence of information or guidance concerning the ingestion of water from shallow creeks, it was assumed that the quantity of water ingested by an adult or child resident while wading in Moncrief Creek is equal to 0.01 liters per hour (L/hr), one-fifth of the recommended ingestion rate for swimming.

In the absence of site-specific and wading data, a conservative exposure time was assumed to be 1 hour per day, the national average for swimming (EPA, 1997a).

The exposure dose model and assumptions for the surface water ingestion route are presented in Tables 4.3 and 4.4.

3.4.2.4 Dermal Absorption from Surface Water. Dermal absorption of chemicals while wading in Moncrief Creek was evaluated for residents. Dermal absorption of chemicals in water may occur when substances are absorbed across the skin. Tables 4.3 and 4.4 present the model and assumptions used to calculate doses through dermal absorption while contacting surface water. The exposed skin areas used to evaluate dermal contact with surface water are outlined below:

- Adult Resident was based on an adult male's hands, forearms, feet, and legs (6,170 cm²).
- Child Resident was based on the 50th percentile surface area of the hands, arms, feet, and legs of males age 3-6 (4,000 cm²).

The permeability coefficients (K_p) used to estimate dermal exposure are chemical-specific and were obtained from EPA guidance (EPA, 1992). As indicated in Table 2.4, only inorganic compounds were retained as COPCs in surface water. Chemical-specific K_p values are not available for the six metals that were retained; therefore, in accordance with EPA guidance (EPA, 1992), the K_p for water [$1\text{E-}03$ centimeters per hour (cm/hr)] was used as a default value for these compounds.

As previously discussed, it was assumed that residents are exposed to COPCs in surface water 45 days per year.

In the absence of site-specific data for wading in Moncrief Creek, it was assumed that the exposure time was 1 hour per day.

3.4.2.5 Ingestion of Groundwater. Groundwater ingestion is considered to be the most significant potential exposure route for residents. The drinking water ingestion rates used for the residents (children and adults) assume that all daily water intake occurs at home. The drinking water ingestion rate for the adult resident is 2 liters per day (L/day) (EPA, 1991). It was assumed that the drinking water intake for children is 1 L/day.

3.5 Uncertainties in Exposure Pathways and Parameters

The exposure assumptions directly influence the calculated doses (daily intakes), and ultimately the risk calculations. For the most part, site-specific data were not available for this baseline risk assessment; therefore, conservative default exposure assumptions were used in calculating exposure doses such as the selection of exposure routes and exposure factors (e.g., contact rate). In most cases, this uncertainty overestimates the most probable realistic exposures and, therefore, overestimates risk. This is appropriate when performing risk assessments of this type so that the risk managers can be reasonably assured that the public risks are not underestimated, and so that risk assessments for different locations and scenarios can be compared.

In order to estimate a receptor's potential exposure at a site, it is necessary to determine the geographical location where the receptor is assumed to be exposed. Once the area of interest has been defined, the appropriate data can be selected and the exposure point concentration can be calculated. The primary source of uncertainty associated with estimating exposure point concentrations involves the statistical methods used to estimate these concentrations and the assumptions inherent in these statistical methods. Generally, an upper bound estimate of the mean concentration is used to represent the exposure point

concentration instead of the measured mean concentration. This is done to account for the possibility that the true mean is higher than the measured mean because unsampled areas of the site may have higher constituent concentrations. Listed below are a few site-specific uncertainties which relate to the EPC calculation.

- Due to small sample data sets (less than 10 samples per data set), the maximum detected concentration in each exposure unit was used to represent the EPC. This may result in an overestimation of risk.
- COPC concentrations in soil for future use were assumed to be the same as current concentrations, with no adjustment due to migration or degradation. This will result in an overestimation dose.
- Only two subsurface soil samples were collected from Exposure Unit 1. These samples were analyzed for lead only; the results for both samples were nondetect. Therefore, no COPCs were identified and subsurface soil was not quantitatively evaluated for Exposure Unit 1.

Ideally, areas of exposure should be defined based on actual exposures or known behaviors of receptors at the site. Often, however, this information is unavailable. Lacking absolute knowledge about the behaviors of receptors at or near the site, it is necessary to make some assumptions. This risk assessment conservatively assumed that current and future use of the site is residential. Such assumptions add to the uncertainty in the baseline risk assessment.

The reasonable maximum exposure concept was used to develop exposure doses in the current and future scenarios and is defined as the "maximum exposure that is reasonably expected to occur at the site" (EPA, 1989). Several variables that were used to determine the exposure dose for the reasonable maximum exposure were generally based on upper-bound (typically 90th percentile or greater) estimates. These are:

- Maximum detected concentration used to calculate the exposure dose.
- Exposure duration (ED) (upper-bound value).
- Intake/contact rate (IR).
- Exposure frequency (EF).

Therefore, the calculated exposure dose for any given chemical, which results from integration of these variables, typically represents an upper-bound probable exposure dose estimate. The use of these

upperbound exposure parameters, coupled with conservative estimates of toxicity, will yield risk results that represent an upper-bound estimate of the occurrence of carcinogenic and noncarcinogenic health effects.

Generally, in order to present a range of possible exposure estimates, a central tendency risk describer is calculated in addition to the reasonable maximum exposure risk. In accordance with Region 4 policy, central tendency risk describers are included in the uncertainty subsection of the risk characterization. The reasonable maximum exposure approach characterizes risk at the upper end of the risk distribution, while the central tendency approach characterizes either the arithmetic mean risk or the median risk. The inclusion of both reasonable maximum exposure and central tendency risk describers provides perspective for the risk manager. However, the National Contingency Plan (NCP) Section 300.430(d) states, "The reasonable maximum exposure estimates for future uses of the site will provide the basis for the development of protective exposure levels."

4.0 Toxicity Assessment

4.1 Introduction

The purpose of the toxicity assessment is to assign toxicity values (criteria) to each chemical evaluated in the risk assessment. The toxicity values are used in combination with estimated doses to which a human could be exposed (as discussed in the Exposure Assessment chapter) to evaluate the potential human health risks associated with each chemical. Human health criteria developed by the EPA (cancer slope factors (CSFs) and RfDs) were primarily obtained from IRIS (EPA, 2000a) or the 1997 HEAST (EPA, 1997b). In some cases, documents from EPA's National Center for Environmental Assessment (NCEA) were used to obtain criteria for chemicals which were not listed in IRIS or HEAST.

4.2 Carcinogenic and Noncarcinogenic Toxicity Values

In evaluating potential health risks, both carcinogenic and noncarcinogenic health effects must be considered. The potential for producing carcinogenic effects is limited to substances that have been shown to be carcinogenic in animals and/or humans. Excessive exposure to all substances, carcinogens and noncarcinogens, can produce adverse noncarcinogenic effects. Therefore, it is necessary to identify reference doses for every chemical selected regardless of its classification, and to identify CSFs for those that are classified as carcinogenic.

4.2.1 Estimates of Noncarcinogenic Toxicity

Toxicity criteria used to evaluate potential noncarcinogenic health effects are termed reference dose factors (RfDs). It is assumed in developing RfDs that a threshold dose exists below which there is no potential for human toxicity. The term RfD was developed by the EPA to refer to the daily intake of a chemical to which an individual can be exposed without any expectation of noncarcinogenic effects (e.g., organ damage, biochemical alterations, birth defects) occurring during a given exposure period. The RfD is derived from a no-observed-adverse-effect level (NOAEL) or lowest-observed-adverse-effect level (LOAEL) obtained from human or animal studies. Standard order-of-magnitude uncertainty factors, and in certain cases, an additional modifying factor are applied to account for professional assessment of scientific uncertainties in the available data (EPA, 1989).

A NOAEL is that dose of chemical at which no toxic effects are observed in any of the test subjects or animals. The study chosen to establish the NOAEL is based on the criterion that the measured toxic endpoint represents the most sensitive ("critical") target organ or tissue to that chemical (i.e., that target organ or tissue that shows evidence of damage at the lowest dose). Since many chemicals can produce

toxic effects on several organ systems, with each toxic effect possibly having a separate threshold dose, the distinction of the critical toxic effect provides added confidence that the NOAEL is protective of health. In contrast to a NOAEL, a LOAEL is the lowest dose at which the most sensitive toxic effect is observed in any of the test subjects or animals. If a LOAEL is used in place of a NOAEL to derive a RfD, an additional level of uncertainty is involved and, therefore, an additional order-of-magnitude uncertainty factor is applied.

A variety of regulatory agencies have used the threshold approach for noncarcinogenic substances in the development of health effects criteria, such as worker-related threshold limit values (TLVs), air quality standards, and food additive and drinking water regulations. EPA has developed chronic RfDs for the oral and inhalation routes, but not for the dermal route. Human data are used preferentially if they are deemed adequate through scientific evaluation. However, in many cases, adequate human toxicity data are not available and animal studies have to be used.

4.2.1.1 Oral Reference Doses. Chronic RfDs were available for most chemicals of potential concern at the Brown's Dump site. Provisional (interim) RfD values were available for aluminum, benzene, cobalt, iron, and trichloroethene. Chemicals for which no RfDs were available are: acenaphthylene, alpha-BHC, aroclor 1260, benzo(a)pyrene (and other carcinogenic PAHs), lead, elemental mercury, and 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). Benzo(a)pyrene (and the remaining carcinogenic PAHs), aroclor 1260, alpha-BHC, and 2,3,7,8-TCDD were evaluated as carcinogens. An oral RfD is not available for elemental mercury because it is not readily absorbed through the oral route. Other forms of mercury, such as mercuric chloride and methylmercury, are more readily absorbed and have oral RfDs available. Because of similar absorption rates and toxicities, it is acceptable to substitute the oral RfD for mercuric chloride when evaluating exposure to mercuric oxide (Chaddery, 1998). Therefore, the oral RfD for mercuric chloride was used to evaluate ingestion of mercury in the Brown's Dump environmental media. Lead is evaluated separately in Subsection 5.4. IRIS lists the oral RfD of 1.4E-01 mg/kg-day for manganese. The explanatory text in IRIS recommends using a modifying factor of three when calculating risks associated with non-food sources (e.g., drinking water). It further recommends subtracting dietary exposure (default assumption is 5 mg). EPA Region 4 recommends the use of modifying factor of 1 when evaluating exposure to manganese in soil. Thus, the IRIS RfD for manganese was changed in this baseline risk assessment to 0.07 mg/kg-day for soil and 0.024 mg/kg-day for water (EPA, 2000a). Finally, it is not known what valence of chromium was detected at the site, either trivalent or hexavalent chromium. Hexavalent chromium is more toxic than trivalent chromium; however, it is easily converted to trivalent

chromium in soil in the presence of organic matter. This risk assessment assumed that only hexavalent chromium was present at the site. The oral RfDs for the COPCs are listed in Table 5.1.

4.2.1.2 Inhalation Reference Doses. Inhalation RfDs are used to evaluate the risk from exposure to chemicals through inhalation exposure pathways such as the inhalation of particulate emissions from surface soil. Inhalation toxicity values are given as reference concentrations for systemic toxicants. The conversion to an inhalation reference dose is accomplished as follows:

$$\text{Inhalation RfD (mg/kg-day)} = \text{RfC mg/m}^3 \times (70 \text{ kg})^{-1} \times 20 \text{ m}^3/\text{day}$$

The inhalation reference doses are listed in Table 5.2.

4.2.1.3 Dermal Reference Doses. No RfDs have been developed by EPA for the dermal route. Therefore, dermal RfDs were derived for the COPCs in accordance with EPA guidelines (EPA, 1989). A chronic dermal RfD was derived for each chemical by multiplying the value used as the chronic oral RfD by an appropriate GI absorption factor. This adjusts the dermal dose for the amount absorbed since dermal exposure doses are expressed as "absorbed" doses (note that oral and inhalation doses are usually expressed as "administered" doses). Oral RfDs are normally developed from long-term studies where a substance is administered orally to laboratory animals. Depending on the form in which the chemical is administered, the relative absorption of the chemical through the gastrointestinal tract (and therefore the relative absorption factor) may vary considerably. Organic compounds tend to be more readily absorbed through the GI tract than inorganic compounds. In the absence of a chemical-specific value (i.e., ATSDR Toxicity Profile), an absorption factor of 80 percent was used for volatile compounds. This value corresponds to the default value suggested by EPA Region 4 for cases in which the GI absorption of a volatile organic substance is not known (EPA, 1995a). In the absence of a chemical-specific value (i.e., ATSDR Toxicity Profile), an absorption factor of 50 percent was used for semivolatile compounds (PAHs, PCBs, pesticides). This value corresponds to the default value suggested by EPA Region 4 for cases in which the GI absorption of a semivolatile organic substance is not known (EPA, 1995a). Metals in general, tend to be poorly absorbed through the gastrointestinal (GI) tract. However, absorption is highly dependent on the water and lipid solubility of the specific chemical form(s) in which it is present. In the absence of a chemical-specific value (i.e., ATSDR Toxicity Profile), an absorption factor of 20 percent was used for inorganics (metals). This value corresponds to the default value suggested by EPA Region 4 for cases in which the GI absorption of a metal is not known (EPA, 1995a). The adjusted dermal RfDs are presented in Table 5.1.

4.2.1.4 Other Issues Pertaining to Reference Doses. Only chronic RfDs, which are developed to evaluate potential toxicity at greater than 7 years of exposure, are presented in Tables 5.1 and 5.2 and are used in estimating both childhood and adult noncarcinogenic risk. Subchronic RfDs are sometimes used to evaluate subchronic exposures of a duration ranging from 2 weeks to 7 years, which may be more appropriate to address childhood exposure (age 1-6 years). However, chronic RfDs, which are lower than subchronic RfDs, are used in this risk assessment to ensure a conservative risk estimate (EPA, 1995a).

Lead was not evaluated quantitatively for noncarcinogenic hazards. As required by EPA Region 4, lead was evaluated in this risk assessment by predicting blood lead levels in children using the IEUBK Model for Lead (Version 0.99d). This predicted blood lead level was compared to that level [10 micrograms per deciliter (ug/dL)] in children which is considered to be associated with several potential noncarcinogenic effects, such as neurotoxicity and altered hemoglobin synthesis. See Subsection 5.4 in the risk characterization for the lead evaluation results.

4.2.2 Estimates of Carcinogenic Potency

Cancer slope factors (CSFs) are developed by the EPA under the assumption that the risk of cancer from a given chemical is linearly related to dose. EPA may develop CSFs from laboratory animal or epidemiological studies in which relatively high doses of the chemical were administered. It is conservatively assumed that these high doses can be extrapolated downward to extremely small doses, with some incremental risk of cancer always remaining until the dose is zero. This nonthreshold theory assumes that even a small number of molecules, possibly even one uncontrolled cell division, could eventually lead to cancer. The SF for a chemical is usually derived by EPA using a linearized multistage model and reflects the upper-bound limit of the cancer potency of the chemical. As a result, the estimated carcinogenic risk is likely to represent a plausible upper limit to the risk. The actual risk is unknown, but is likely to be considerably lower than the predicted risk (EPA, 1989), and may even be as low as zero.

There is some dispute as to whether the extrapolation from high to low doses is a realistic approach. It has been argued that at low doses cells may have the ability to detoxify carcinogens or repair chemical-induced cellular damage. Although it is important to recognize the possibility that some carcinogens may have a threshold for toxicity, it was assumed in the estimates of risk that no threshold exists.

Specific carcinogenicity classifications for carcinogenic chemicals of potential concern at the Brown's Dump site are presented in Table 6.1. Risk assessments follow the rationale used by EPA in developing these categories of classification. Only those chemicals classified as "A" have sufficient human evidence of

carcinogenicity. Carcinogens classified as "B" and "C" have insufficient human data to support their cancer-causing potential, but have varying degrees of supportive animal data. It should be noted that A, B, and C carcinogens are evaluated in risk assessments according to EPA guidance (EPA, 1989). This adds a degree of conservatism to the risk assessment since possible human carcinogens (B and C) are weighted equally in terms of total cancer risk relative to known human (A) carcinogens. Finally, it is important to note that SFs are periodically under review by the EPA. In some cases, the EPA may withdraw the criteria until the review is completed.

The carcinogenic potency of a substance depends on its route of entry into the body (i.e., oral, inhalation, or dermal). Therefore, SFs are developed and classified according to the administration route. In some cases, a carcinogen may produce tumors only at or near a specific route of entry (e.g., nasal passages) and may not be carcinogenic through other exposure routes. This applies to chromium and cadmium. Note also that EPA has not developed dermal SFs for any carcinogens (EPA, 1998).

4.2.2.1 Oral Slope Factors. Oral SFs are used to evaluate the risk from exposure to potential carcinogens through oral exposure pathways such as incidental ingestion of soil and surface water, and ingestion of groundwater. With the exception of beryllium, cadmium, chromium, and lead, oral SFs were available for all the carcinogens listed in Table 6.1. An oral SF for beryllium is not available because the human carcinogenic potential of ingested beryllium can not be determined. Oral SFs are not relevant to cadmium and chromium because there is not adequate evidence of carcinogenicity for these substances through the oral route. Lead is considered to be a potential carcinogen through the oral route; however, EPA's Carcinogen Assessment Group recommends that a numerical estimate not be used to evaluate its potential risk. The carcinogenicity of lead is discussed further in Subsection 5.4.

4.2.2.2 Inhalation Slope Factors. Inhalation SFs are used to evaluate the risk from exposure to potential carcinogens through inhalation exposure pathways such as the inhalation of particulate emissions from surface soil. Inhalation toxicity values are given as unit risks for carcinogens. The conversion to an inhalation SFs is accomplished as follows:

$$\text{Inhal. SF} = \text{Unit Risk } (\mu\text{g}/\text{m}^3)^{-1} \times 70 \text{ kg} \times (20 \text{ m}^3/\text{day})^{-1} \times 1,000 \mu\text{g}/\text{mg} \\ (\text{mg}/\text{kg}\text{-day})^{-1}$$

The inhalation SFs are listed in Table 6.2.

4.2.2.3 Dermal Slope Factors. As with reference doses, dermal SFs are not available from the EPA, but it was assumed that chemicals which are carcinogenic orally will also produce cancer by dermal exposure. In the absence of dermal SFs, the oral SFs is divided by an appropriate GI absorption factor (EPA, 1989). This adjusts the dermal dose for the amount absorbed since dermal exposure doses are expressed as "absorbed" doses (note that oral and inhalation doses are usually expressed as "administered" doses). Oral SFs are normally developed from long-term studies where a substance is administered orally to laboratory animals. Depending on the form in which the chemical is administered, the relative absorption of the chemical through the gastrointestinal tract (and therefore the relative absorption factor) may vary considerably. The approach used to select the absorption factor was the same as that previously described for RfDs. In the absence of chemical-specific values, the default absorption factors were 80 percent for volatile organic compounds, 50 percent for semivolatile organic compounds, and 20 percent for metals (EPA, 1995a).

Beryllium, cadmium and chromium VI are classified as being carcinogenic by the inhalation route only. Beryllium has been shown to produce lung cancer; however, studies regarding the potential carcinogenicity of beryllium via the oral or dermal routes are not available. Hexavalent chromium, which produces cancer only at the route of entry, was not evaluated for oral or dermal cancer risk. There is inadequate evidence that cadmium is carcinogenic via the oral or dermal route. The adjusted dermal SFs are presented in Table 6.1.

4.2.2.4 Other Issues Pertaining to Cancer Slope Factors. Although lead is classified by EPA as a Group B2 (probable human) carcinogen (EPA, 2000a), quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence absorption, release, and excretion of lead. In addition, current knowledge of lead pharmacokinetics indicate that an estimate derived by standard procedures would not truly describe the potential risk (EPA, 2000a). Therefore, EPA and EPA Region 4 recommend that a numerical estimate not be used to evaluate its carcinogenic potency. However, lead is qualitatively evaluated by comparing maximum detected concentrations to existing risk-based values (i.e., drinking water standards and residential soil cleanup levels).

As an interim procedure, EPA Region 4 has adopted a Toxicity Equivalence Factor (TEF) methodology for evaluating risk from exposure to carcinogenic PAHs. These TEFs are based on the relative potency of each compound relative to that of benzo(a)pyrene. The TEFs are used to convert each carcinogenic PAH concentration to an equivalent concentration of benzo(a)pyrene (see Tables 3.1 through 3.5). The

SF for benzo(a)pyrene is then used to evaluate risks from exposure to the adjusted concentrations of the carcinogenic PAHs.

A similar approach is used to evaluate risk from exposure to dioxin and dioxin-like compounds. TEFs have been developed based on the current understanding of the toxicology of 2,3,7,8-TCDD. Using the appropriate TEF, the concentrations of congeners of 2,3,7,8-TCDD are converted to an equivalent concentration of 2,3,7,8-TCDD. The SF for 2,3,7,8-TCDD is then used to evaluate risks for exposure to the adjusted concentrations of the dioxin compounds.

4.3 Chemical-Specific Toxicity Assessments

Toxicological information on the primary COPCs detected at the site is provided in Appendix D.

4.4 Uncertainties Associated With Toxicity Assessment

For a risk to exist, both significant exposure to the chemicals of potential concern and toxicity at these predicted exposure levels must exist. The toxicological uncertainties primarily relate to the methodology by which carcinogenic and noncarcinogenic criteria (i.e., CSFs and reference doses) are developed. In general, the methodology currently used to develop CSFs and reference doses is very conservative, and likely results in overestimation of human toxicity (EPA, 1989). These and other factors are discussed in the subsections below.

4.4.1 Reference Doses

In the development of RfDs for each chemical by exposure route, it is assumed that a threshold dose exists below which there is no potential for adverse health effects to the most sensitive individuals in the population. The RfD is typically derived from dose-response studies in animals in which a NOAEL or a LOAEL is determined by applying several uncertainty factors of 10 each. An additional modifying factor of up to 10 can be applied which accounts for a qualitative professional assessment of additional uncertainties in the available toxicity data (EPA, 1989a). The final degree of extrapolation for a given chemical can range anywhere between 10 and 100,000 resulting in a human subthreshold dose of one tenth to one-hundred thousandth of the study dose. In general, the calculated RfD is likely overly protective, and its use probably results in an overestimation of noncarcinogenic risk.

4.4.1.1 Use of Chronic RfDs in Children. Oral chronic RfDs were used in calculating hazard quotients for the 1 to 6 year old child. The use of chronic RfDs in this age group is conservative and will result in overestimation of risk. Chronic RfDs are developed assuming a lifetime daily exposure.

Subchronic RfDs, which are calculated assuming an exposure duration of 2 weeks to 7 years, generally tend to be higher than chronic RfDs and result in a lower hazard quotient and index.

4.4.2 Cancer Slope Factors

Although there is evidence to suggest some carcinogens may exhibit thresholds, CSFs are developed assuming there is no safe level of exposure to any pollutant proven or suspected to cause cancer. This uncertainty implies that exposure to even a single molecule of a chemical may be associated with a finite risk, however small. The assumption is that even if relatively large doses of a chemical were required to cause cancer in laboratory animals (i.e., much higher than a person would ever likely be exposed to over a lifetime), these EDs exposure doses can be linearly extrapolated downward many orders of magnitude to estimate SFs. A significant uncertainty for the carcinogens is whether the CSFs accurately reflect the carcinogenic potency of these chemicals at low exposure concentrations. The calculated SF is used to estimate an upperbound lifetime probability of an individual developing cancer as a result of exposure to a particular carcinogen level. Therefore, the CSFs developed by EPA are generally conservative and represent the upperbound limit of the chemical's carcinogenic potency. The actual risk posed by each chemical is unknown but is likely to be lower than the calculated risk, and may even be as low as zero (EPA, 2000a). The conclusion is that these toxicity assumptions will typically result in an overestimation of carcinogenic risk.

The assumption that all carcinogens (whether A, B1 or B2) can cause cancer in humans is also conservative. Only those chemicals classified as "A" carcinogens by the EPA are unequivocally considered human carcinogens. In this risk assessment, all "probable" and "possible" carcinogens are given the same weight in the toxicity assessment (and consequently in the estimation of risk) as true human carcinogens. This assumption most likely overestimates actual carcinogenic risk to human receptors.

4.4.3 Metal Speciation

There are many uncertainties associated with toxicity values, especially those that are derived from studies in laboratory animals. One general uncertainty concerns toxicity values for metals. The form in which a metal occurs can greatly influence its toxicity potential. However, the metal speciation in on-site media is not known. Typically, the salts of metals are used for animal testing because these forms are most readily absorbed by the animals. Therefore, the toxicity values that are generated from these data represent the toxicity potential of the metals in their soluble forms. In characterizing risk, the assumption is made that the metals at the site are present in forms similar to those used in characterizing the toxicity potentials of those

substances. This uncertainty may specifically apply to manganese where it is well documented that the nature of the salt can significantly affect gastrointestinal absorption (EPA, 1998).

4.4.4 Site-Specific Toxicological Uncertainties

Site-specific uncertainties include:

- Not assessing risks for chemicals without critical toxicity values.
- Using route-to-route extrapolation to calculate dermal risks.
- Using provisional toxicity values to calculate risks. Provisional toxicity values are interim values that are established by the NCEA but have not been approved by EPA and, as such, are not listed in IRIS or HEAST.
- Assuming that only hexavalent chromium is present at the site.

5.0 Risk Characterization

The objective of the risk characterization is to integrate the exposure and toxicity assessments into quantitative and qualitative expressions of risk. A detailed risk characterization is presented in this section.

5.1 Introduction

The risk characterization is an evaluation of the nature and degree of potential carcinogenic and noncarcinogenic health risks posed to current and future receptors at the former Brown's Dump site. The pathways of exposure are described in Section 3.0. Human health risks for noncarcinogenic and carcinogenic effects are discussed independently because of the different toxicological endpoints, relevant exposure durations, and methods employed in characterizing risk. The potential for carcinogenic effects is limited to only those chemicals classified as carcinogens, while both carcinogenic and noncarcinogenic chemicals are evaluated for potential noncarcinogenic effects.

Noncarcinogenic and carcinogenic risks were evaluated for each exposure pathway and scenario by integrating the exposure doses calculated in Section 3.0 (Exposure Assessment) with the toxicity criteria determined in Section 4.0 (Toxicity Assessment) for the chemicals of potential concern. The evaluation of noncarcinogenic risks are summarized in Subsection 5.2, and the evaluation of carcinogenic risks are summarized in Subsection 5.3.

The risk characterization tables (7.1 through 7.5 and 8.1 through 8.10) present the EPCs, intake factors, toxicity values, and the quantification of risks and hazards. Each table contains an intake factor which was generated from the formulas and assumptions presented in Tables 4.1 through 4.6. The RfDs and SFs came from Tables 5.1, 5.2, 6.1, and 6.2. The hazards or risks from each chemical are summed to yield the final pathway risks or hazard index (HI). Summaries of receptor risks and hazards are presented in Tables 9.1 through 9.10. Tables 10.1 through 10.6 present cancer risk and noncancer hazard information for those COPCs and media/exposure points that may trigger the need for remedial action. Finally, Tables 11.1 and 11.2 provide a summary of the hazards and risks for each receptor evaluated in the risk assessment.

5.2 Evaluation of Noncarcinogenic Risks

The risk of adverse noncarcinogenic effects from chemical exposure is expressed in terms of the HQ. The HQ is the ratio of the estimated dose (DI) that a human receives to the RfD, the estimated dose below

which it is unlikely for even sensitive populations to experience adverse health effects. The HQ is calculated as follows (EPA, 1989):

$$HQ = DI/RfD$$

Where:

| | | |
|-----|---|----------------------------|
| HQ | = | Hazard Quotient (unitless) |
| DI | = | Daily Intake (mg/kg/day) |
| RfD | = | Reference Dose (mg/kg/day) |

All the HQ values for chemicals within each exposure pathway are summed to yield the HI. Each pathway HI within a land use scenario (e.g., future child resident) is summed to yield the total HI for the receptor. If the value of the total HI is less than 1.0, it is interpreted to mean that the risk of noncarcinogenic injury is low. If the total HI is greater than 1.0, it is indicative of some degree of noncarcinogenic risk, or effect, and contaminants of concern are selected (EPA, 1995a). Contaminants of concern are those COPCs that contribute a HQ of 0.1 or greater to any pathway evaluated for the use scenario. Using the HQ equation, the chronic DI values, and the RfD values, a hazard index for current and future child residents was estimated by calculating a HQ for each chemical of potential concern associated with a complete pathway and exposure point. Only chronic HIs are derived, as the subchronic risks will always be equal to or less than the chronic risks. The results of these calculations are presented in Tables 7.1 through 7.5 and 9.1 through 9.5. The following paragraphs summarize the hazard indices for child residents in each exposure unit.

The total HI for **current child residents** exposed to surface soil in Exposure Unit 1 (unrestricted school property) and surface water in Moncrief Creek was 1, primarily due to incidental ingestion of iron, antimony, and arsenic in surface soil. The total HI for **future child residents** exposed to surface soil in Exposure Unit 1, surface water in Moncrief Creek, and groundwater was 4. This HI is primarily due to ingestion of aroclor 1016, arsenic, manganese, and iron in groundwater.

The total HI for **current child residents** exposed to surface soil in Exposure Unit 2 (restricted area north of the school property) and surface water in Moncrief Creek was 12, primarily due to incidental ingestion of iron, arsenic, copper, and antimony in surface soil. The total HI for **future child residents** exposed to surface soil in Exposure Unit 2, surface water in Moncrief Creek, and groundwater was 14. This HI is primarily due to incidental ingestion of iron, arsenic, copper, and antimony in surface soil, and ingestion of

aroclor 1016, manganese, iron, and arsenic in groundwater. The total HI for **future child residents** in Exposure Unit 2 when exposed to subsurface soil instead of surface soil was 25, primarily due to incidental ingestion of iron, arsenic, and antimony in subsurface soil, and ingestion of aroclor 1016, manganese, iron, and arsenic in groundwater.

Tables 10.1 through 10.3 present noncancer hazard information for those COPCs and media/exposure points that may trigger the need for remedial action. Table 11.1 presents a summary of the noncarcinogenic hazards for child residents exposed to environmental media in Exposure Units 1 and 2.

5.3 Evaluation of Carcinogenic Risks

The incremental risk of developing cancer from exposure to a chemical at the site is defined as the additional probability that an individual exposed will develop cancer during his or her lifetime (assumed to be 70 years). This value is calculated from the average daily intake over a lifetime (CDI) and the SF for the chemical as follows (EPA, 1989):

$$\text{Risk} = \text{CDI} \times \text{SF}$$

When the product of CDI x SF is greater than 0.01, this expression may be estimated as:

$$\text{Risk} = 1 - \exp^{(-\text{CDI} \times \text{SF})}$$

Using the first equation, where appropriate, and employing the CDI values calculated for lifetime exposure along with the SF values (Tables 6.1 and 6.2), cancer risks were calculated for lifetime exposures which may occur at the former Brown's Dump site. A summary of the results is presented in the risk characterization tables (8.1 through 8.10 and 9.1 through 9.10). It is important to note that the carcinogenic risk estimates presented in Tables 8.1 through 8.10 and 9.1 through 9.10 represent the summation of the individual risks associated with each of the chemicals of potential concern for which cancer information is adequately available.

According to EPA policy, the target total individual risk resulting from exposures at a Superfund site may range anywhere between 1E-06 and 1E-04 (EPA, 1991). Thus, remedial alternatives should be capable of reducing total potential carcinogenic risks to levels within this range for individual receptors. OSWER Directive 9355.0-30, issued on April 22, 1991, provides further insight into the acceptable risk range when it states: "Where the cumulative carcinogenic site risk to an individual based on reasonable maximum

exposure for both current and future land use is less than 10^{-4} , and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts. However, if maximum contaminant levels (MCLs) or non-zero maximum contaminant level goals (MCLGs) are exceeded, action generally is warranted. A risk manager may also decide that a baseline risk level less than 10^{-4} is unacceptable due to site-specific reasons and that a remedial action is warranted. The upper boundary of the risk range is not a discrete line at 1×10^{-4} , although USEPA generally uses 1×10^{-4} in making risk management decisions. A specific risk estimate around 10^{-4} may be considered acceptable if justified based on site-specific conditions."

A risk estimate of 1×10^{-4} was used as the remediation "trigger" in this risk assessment. If the cumulative site cancer risk exceeded 1×10^{-4} , then contaminants of concern were identified. A summary of carcinogenic risks for each population is discussed below.

The total incremental lifetime cancer risk for **current residents** in Exposure Unit 1 was 7×10^{-5} . This represents the sum of a child (age 1 to 6), and adult, who is exposed to surface soil at the unrestricted school property and surface water in Moncrief Creek. The risk was primarily due to incidental ingestion of and dermal contact with CPAHs in surface soil, and incidental ingestion of arsenic and 2,3,7,8-TCDD in surface soil.

The total incremental lifetime cancer risk for **future residents** in Exposure Unit 1 was 1×10^{-4} . This represents the sum of a child (age 1 to 6), and adult, who is exposed to surface soil at the unrestricted school property, surface water in Moncrief Creek, and groundwater. The risk was primarily due to ingestion of arsenic, aldrin, heptachlor, and heptachlor epoxide in groundwater, and incidental ingestion of and dermal contact with CPAHs in surface soil, and incidental ingestion of arsenic and 2,3,7,8-TCDD in surface soil.

The total incremental lifetime cancer risk for **current residents** in Exposure Unit 2 was 2×10^{-4} . This represents the sum of a child (age 1 to 6), and adult, who is exposed to surface soil in the restricted area north of the school property and surface water in Moncrief Creek. The risk was primarily due to incidental ingestion of arsenic, 2,3,7,8-TCDD, CPAHs, aroclor 1260, and dieldrin in surface soil.

The total incremental lifetime cancer risk for **future residents** in Exposure Unit 2 was 2×10^{-4} . This represents the sum of a child (age 1 to 6), and adult, who is exposed to surface soil in the restricted area north of the school property, surface water in Moncrief Creek, and groundwater. The risk was primarily

due to incidental ingestion of arsenic, 2,3,7,8-TCDD, CPAHs, aroclor 1260, and dieldrin in surface soil, and ingestion of arsenic, aldrin, heptachlor, and heptachlor epoxide in groundwater. The total incremental lifetime cancer risk for **future residents** in Exposure Unit 2 when exposed to subsurface soil instead of surface soil was 4E-04, primarily due to incidental ingestion of arsenic in subsurface soil, and ingestion of arsenic, aldrin, heptachlor, and heptachlor epoxide in groundwater.

Tables 10.1 through 10.6 present cancer risk information for those COPCs and media/exposure points that may trigger the need for remedial action. Table 11.2 presents a summary of the carcinogenic risks for adult and child residents exposed to environmental media in Exposure Units 1 and 2.

5.4 Lead Toxicity

Although there is a great deal of information on its health effects, there is not an EPA SF or RfD dose for lead. It appears that some health effects, particularly changes in the levels of certain blood enzymes and in aspects of children's neurobehavioral development, may occur at blood lead levels so low as to be essentially without a threshold. Therefore, EPA considers it inappropriate to develop an RfD for inorganic lead (EPA, 2000a). Quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence the absorption, release, and excretion of lead. In addition, current knowledge of lead pharmacokinetics indicates that an estimate derived by standard procedures would not truly describe the potential risk. Thus, EPA's Carcinogen Assessment Group recommends that a numerical estimate not be used (EPA, 2000a).

In the absence of lead health criteria, two approaches were used to assess risks associated with exposure to lead at the former Brown's Dump site. The first was to predict mean lead blood levels in children using the IEUBK Model for Lead (Version 0.99d). The second approach was to compare the maximum detected concentrations of lead in the environmental media at the site to available ARARs or screening levels (e.g., federal action levels for drinking water, residential cleanup levels in soil).

5.4.1 Lead Uptake Biokinetics Model

Blood levels of lead in the age group ranging from 0 to 7 years of age can be predicted with the IEUBK. EPA Region 4 recommends its use to provide an estimation of chronic blood lead concentrations in children based, as much as possible, on site-specific data. Such data can assist in the risk management decision regarding cleanup of lead at hazardous waste sites. The lead model was used to evaluate lead risks in Exposure Units 1 and 2. However, lead risks in all residential areas were evaluated by screening detected

concentrations against EPA's residential screening level of 400 mg/kg. This screening level is also based on the lead model.

Neurotoxic effects of chronic low-level lead exposure in children may occur at lead blood levels as low as 10 ug/dL. Therefore, a blood-lead level of 10 ug/dL is utilized as a standard for this analysis and the site is considered to be of concern for lead if the model predicts that more than five percent of a population will exceed this level.

The model allows the input of specific lead exposure parameters associated with the site, where available. Where site-specific information is not available, standard default factors are substituted. The information that was available for inputs included the concentrations of lead detected in surface soil and groundwater. In accordance with Region 4 guidance, the average detected lead concentrations were input into the model. As previously discussed, the surface soil at the site was divided into two exposure areas - Exposure Unit 1 and Exposure Unit 2. For the current scenario, the average lead concentration in surface soil in each of the two areas was input into the model to derive predicted blood lead levels for children who may be exposed to either of the two exposure units. Using the average lead concentration for Exposure Unit 1 (soil 179 mg/kg), the results indicated that the mean blood level of lead would be 3.6 ug/dL in the 0-7 year old child hypothetically exposed to surface soil in this area of the site (Figure 5-1), with the probability that 1.39 percent of all measurements would be above 10 ug/dL. For Exposure Unit 2 (soil 2,263 mg/kg), the results indicated that the mean blood level of lead would be 11.6 ug/dL in the 0-7 year old child hypothetically exposed to surface soil in this area of the site (Figure 5-2), with the probability that 58.29 percent of all measurements would be above 10 ug/dL.

For the future scenario, it is assumed that residents may use a private well for potable water. Therefore, the average lead concentration in surface soil and groundwater (see Table 3-5) were input into the model to derive predicted blood lead levels for children who may be exposed to either of the two exposure units. Using the input parameters for Exposure Unit 1 (groundwater 2 ug/L, soil 179 mg/kg), the results indicated that the mean blood level of lead would be 3.5 ug/dL in the 0-7 year old child hypothetically exposed to groundwater and surface soil in Exposure Unit 1 (Figure 5-3), with the probability that 1.10 percent of all measurements would be above 10 ug/dL. For Exposure Unit 2 (groundwater 2 ug/L, soil 2,263 mg/kg), the results indicated that the mean blood level of lead would be 11.5 ug/dL in the 0-7 year old child hypothetically exposed to groundwater and surface soil in Exposure Unit 2 (Figure 5-4), with the probability that 58.29 percent of all measurements would be above 10 ug/dL.

Although exposure to groundwater was included as an additional exposure pathway, the mean blood level of lead decreases slightly under the future scenarios for Exposure Units 1 and 2. This is because the average detected lead concentration in groundwater at the Brown's Dump site (2 ug/L) was less than the default concentration that is used in the lead model (4 ug/L).

There is scientific but controversial evidence that subtle neurobehavioral effects in children such as lowered IQ scores, learning disabilities, and attention deficits may occur at chronic blood levels between 10 and 15 ug/dL. These blood lead levels may also be associated with decreased hemoglobin production in the red blood cells with resultant anemia. The mean blood levels of 11.6 ug/dL (current scenario) and 11.5 ug/dL (future scenario) in Exposure Unit 2 (restricted area north of the school) are above EPA's current health-based level of concern of 10 ug/dL. Under both the current and future scenarios, 58 percent of the children exposed to contaminants in Exposure Unit 2 could develop blood-lead levels above the target level of 10 ug/dL.

Samples were collected on January 15, 2002, from three gardens located near the Jacksonville Ash 5th and Cleveland site. Two surface soil samples and two vegetable samples were collected from each of the three gardens. The soil samples and vegetable samples were analyzed for lead, arsenic, antimony, and PAHs. Only lead was detected in the vegetables and each of the gardens represented a different level of soil lead contamination. Listed below are the maximum concentrations of lead in the garden soils and the maximum detected concentration of lead in the corresponding vegetable sample:

1. Garden 1: maximum soil lead concentration of 500 mg/kg with a maximum vegetable lead concentration of 0.16 mg/kg,
2. Garden 2: maximum soil lead concentration of 4,400 mg/kg with a maximum vegetable lead concentration of 0.28 mg/kg
3. Garden 3: maximum soil lead concentration of 73 mg/kg with a maximum vegetable lead concentration of 0.089 mg/kg,

The vegetables sampled were collard and/or mustard greens. These vegetables were chosen because of their availability and the fact that they were thought to represent the vegetables most likely to bioaccumulate lead, therefore providing the most conservative data available.

To determine if the lead levels detected would result in an unacceptable risk via ingestion of the vegetables, the IEUBK model was run using the maximum detected lead concentrations in the vegetables from each

of the three gardens. For this modeling event, it was conservatively assumed that 25 percent of all vegetables ingested come from the home garden and assumed that all of the vegetables ingested from that garden have the same concentration of lead in them. These are very conservative assumptions for four reasons:

- 1) 25 percent of all vegetables consumed are assumed to come from the garden,
- 2) the lead concentration in all vegetables are assumed to be the same as the concentration detected in the greens (e.g., tomatoes would have the same concentration as greens),
- 3) the data may represent some soil particles because the vegetables were washed but not actually cleaned of all dirt before being analyzed, and
- 4) exposure to children, the most sensitive receptor population, was evaluated.

The results of the IEUBK model conclude that under these circumstances the average blood lead level would only slightly increase even at the highest detected concentrations of lead in the greens. EPA Region 4 uses the Probability Distribution curve as one of its decision making tools. The goal is for the probability of being above the 10 ug/dl blood lead level cutoff to be less than 5 percent. The two lower detected concentrations are below 5 percent (2 percent and 3 percent, respectively) with the highest detected concentration being at 5.6 percent which is only slightly above the 5% goal.

It can be concluded from the above information that there is no unacceptable risks associated from ingestion of vegetables from gardens with soil lead concentrations less than 500 mg/kg. The two samples collected from the highest soil lead contamination location (maximum concentration of 4,400 mg/kg lead) showed a slight increase above acceptable levels via ingestion of vegetables, but it has already been determined by EPA that residential exposure to soils with lead concentrations of 4,400 mg/kg is unacceptable via direct contact to those soils.

In conclusion, based on the above data and references, the use of vegetable gardens with soil lead concentrations below or only slightly above EPA's recommended remedial goal of 400 mg/kg should not result in any significant increase in blood lead levels. Garden soil levels of lead significantly above 400 mg/kg may pose unacceptable risk with the risk potential increasing with increasing levels of soil lead. Regardless of the soil lead level, following good gardening and food preparation practices will lower risks.

5.4.2 Comparison of Lead Maximum Detected Concentrations to ARARs

The maximum detected concentrations of lead were compared to relevant ARARs or screening levels as shown in Table 5A. The maximum groundwater concentration of 0.0032 mg/L is lower than the current action level of 0.015 mg/L published by the Office of Drinking Water of the EPA. The 0.015 mg/L level was based on protection of children from adverse effects when their blood lead levels reached 10 µg/dL.

Table 5A
Comparison of Maximum Detected Concentrations of Lead to ARARs
and Screening Levels
Brown's Dump
Jacksonville, Florida

| Groundwater (mg/L) | | | Soil (mg/kg) | | | | |
|--|--|-------------------------------|--|---|---|--|---|
| Drinking Water Action Level ^a | Surficial Aquifer Maximum Detected Concentration | Number of Detects Above 0.015 | Residential Screening Level ^b | Exposure Unit 1 - Surface Soil Maximum Detected Concentration | Exposure Unit 1 - Number of Detects Above 400 | Exposure Unit 2 - Soil Maximum Detected Concentration* | Exposure Unit 2 - Number of Detects Above 400 |
| 0.015 | 0.0032 | 0/14 | 400 | 780 | 1/7 | 9,100 J | 3/6 |

Notes:

- ^a Represents current action level for lead published by the Office of Drinking Water, EPA.
- ^b Represents the EPA soil screening level for residential soil.
- * Includes all surface and subsurface soil sampling locations.

The maximum detected surface soil concentrations were 780 mg/kg and 9,100 mg/kg in Exposure Unit 1 and Exposure Unit 2, respectively. Lead was detected at concentrations exceeding the residential cleanup goal in 1 out of 7 samples in Exposure Unit 1, and 3 out of 6 samples in Exposure Unit 2 (including the three subsurface soil samples that were collected from Exposure Unit 2).

5.4.3 Summary of Previous Blood Lead Study

In 1995, the Duval County Health Department conducted free lead screening for Pre-Kindergarten and Kindergarten children attending the Mary McLeod Bethune Elementary School. Using the capillary method, five out of 100 children screened (5 percent) had blood lead levels between 10-15 µg/dL. More than 30 children were screened from the Bessie Circle apartment area; one child had a blood lead level of 12 µg/dL. The Health Department then screened 56 more children in Moncrief Village and Palm Terrace Apartment complexes; one had a blood lead level of 10 µg/dL. They screened eight children at a nearby day care; none had a blood lead level greater than 10 µg/dL. In summary, the County Health Department

screened a total of 194 area children. Eight (4.1 percent) had capillary blood lead levels greater than 10 ug/dL. The Duval County Health Department reported that the percentage of children in this area with blood lead levels greater than 10 ug/dL (4 percent) was less than the county-wide percentage (9 percent) (Florida Department of Health, 1997).

The body eliminates most of the lead in the blood in four to five months. Therefore, blood measurements reflect only recent exposure, not long-term exposure. Following increased awareness due to soil sampling and publicity about the site, people may have modified their behavior and reduced their exposure (e.g., washing children's hands after playing). If people reduced their exposure, their blood lead levels would decrease. Therefore, blood lead levels below 10 ug/dL do not prove that significant lead exposure did not occur in the past (Florida Department of Health, 1997).

5.4.4 Conclusions

Soil lead concentrations greater than 400 mg/kg in residential areas should be considered a potential health threat. The degree of threat depends on the bioavailability of the lead. The lead model applies default assumptions in estimating the bioavailability of lead; however, the bioavailability of lead at the Brown's Dump site was not measured. Primarily due to the concentration of lead in soil, exposure to lead at the site may present a significant risk to receptors at the site if incidental ingestion occurs. Following good gardening and food preparation practices will lower any potential risks associated with eating vegetables from home gardens.

As discussed in Section 2.3.1, XRF data are likely to underestimate the concentrations of lead at the site. Therefore, EPA expects XRF measurements between 200 mg/kg and 400 mg/kg to be confirmed by laboratory analysis. To ensure that XRF lead measurements below 200 mg/kg are not actually above 400 mg/kg, EPA further evaluated the XRF and laboratory data for lead. The evaluation indicated an error of 1.7 percent when XRF lead measurements under 200 mg/kg were compared with corresponding fixed laboratory analytical lead measurements exceeding 400 mg/kg. In other words, 98.3% of XRF samples with less than 200 mg/kg lead also show a lead concentration from a fixed laboratory less than 400 mg/kg, the risk based remedial goal option for lead.

5.5 Uncertainties Associated With Risk Characterization

Ideally, areas of exposure should be defined based on actual exposures or known behaviors of receptors at the site. Often, however, as in the case of this risk assessment, this information is unavailable. Lacking absolute knowledge about the behaviors of receptors at or near the site, it was necessary to make some

assumptions. This risk assessment made assumptions about exposure units (or areas) based on contaminant distribution and likely areas of exposure based on site features (e.g., presence of the restricted area north of the school). Such assumptions will add to the uncertainty in the baseline risk assessment.

The number of samples used to evaluate a particular medium should also be considered. Unfortunately, a limited number of samples were used to evaluate groundwater at this site. Again, contributing to the uncertainty in the baseline risk assessment.

Each complete exposure pathway concerns more than one contaminant. Uncertainties associated with summing risks or hazard quotients for multiple substances are of concern in the risk characterization step. The assumption ignores the possibility of synergistic or antagonistic activities in the metabolism of the contaminants. This could result in over-or under-estimation of risk.

The potential risks developed for the Brown's Dump site were directly related to COPCs detected in the environmental media at this site. No attempt was made to differentiate between the risk contributions from other sites and those being contributed from the Brown's Dump site.

Because inorganic chemicals are naturally-occurring, metals are generally compared to site-specific background concentrations when selecting COPCs for a site. If the maximum detected concentration of an inorganic chemical is less than two times the mean background concentration, the chemical is excluded as a COPC in that medium. Samples were collected during the RI field investigation to serve as background samples for the Brown's Dump site. However, since the boundaries of the ash had not been delineated, inorganic compounds detected in soil were not screened against the background samples due to the uncertainty associated with obtaining "true" background samples from this area. Therefore, no metal was excluded as a COPC in soil based on a comparison with background. This may result in an overestimation of risk.

Soil lead concentrations greater than 400 mg/kg in residential areas should be considered a potential health threat. However, the degree of threat depends on the bioavailability of the lead. The lead model applies default assumptions in estimating the bioavailability of lead; however, the bioavailability of lead at the Brown's Dump site was not measured. Available blood lead data for children attending the school indicates that the bioavailability of lead at the Brown's Dump site is low.

Aluminum and iron were identified as chemicals of concern at the site. The RfDs for both of these metals are provisional (interim) values, meaning that they have not gone through the verification necessary to be placed by EPA on IRIS or HEAST. Additional toxicological data would be needed in order to complete this verification process. For example, the oral RfD for iron was derived based on inadvertent consumption of iron following consumption of beer brewed in iron vessels. Chromium was also identified as a chemical of concern in soil. As indicated in Subsection 4.2.1.1, this risk assessment assumed that only hexavalent chromium, the more toxic form of chromium, was present at the site. While this likely results in some overestimation of risk, this uncertainty could be reduced by analyzing samples from areas of concern for hexavalent chromium.

Carcinogenic PAHs were identified as COCs in surface soil in Exposure Units 1 and 2. If PAHs were disposed with ash 40 years ago, these compounds would have likely degraded over time. Therefore, it is possible that the CPAHs detected in surface soil came from sources other than ash (e.g., asphalt). If, however, the CPAHs are indeed originating from the ash, it is likely that they were incorporated into a hard matrix where they are not likely to be bio-accessible (ATSDR, 1995).

2,3,7,8-TCDD (dioxin) was identified as a COC in surface soil in Exposure Units 1 and 2, and subsurface soil in Exposure Unit 2. IRIS does not currently list an RfD or SF for 2,3,7,8-TCDD. EPA is currently reassessing the toxicity of dioxin. The toxicity data used in this risk assessment were obtained from the 1997 HEAST. Also, as mentioned in Subsection 2.3.1, 53 dioxin samples that were analyzed by Draft Screening Method 4425 were not used in the baseline risk assessment because of uncertainty associated with the analytical method. Using the 1997 HEAST toxicity data and excluding the dioxin screening data may lead to an under- or overestimation of risk.

All of the uncertainties discussed in Subsections 2.3, 3.5, and 4.4, and this subsection ultimately effect the risk estimate. Most of the uncertainties identified will result in the potential for overestimation of risk (e.g., the combination of several upper-bound assumptions for some exposure scenarios).

5.5.1 Central Tendency Evaluation

In accordance with EPA guidance, quantitative risk values were also developed for "central tendency" exposure assumptions. Central tendency evaluations present average or median (50th percentile) assumptions while reasonable maximum exposure evaluations present upperend (90th - 95th percentile) assumptions. Conducting both reasonable maximum exposure and central tendency analyses provides perspective for the risk manager.

As indicated in Subsections 5.2 and 5.3, the following scenarios, media, and contaminants posed unacceptable risks at the Brown's Dump site:

- **Scenario:** Child Resident
Media: Soil; Groundwater
COCs: Soil: Aluminum, Antimony, Aroclor 1260, Arsenic, Barium, Cadmium, Carcinogenic PAHs, Chromium, Copper, Dieldrin, Dioxins (2,3,7,8-TCDD), Iron, Lead, Manganese, and Zinc.
Groundwater: Aldrin, Aroclor 1016, Arsenic, Heptachlor, Heptachlor Epoxide, Iron, and Manganese.
- **Scenario:** Adult Resident
Media: Soil; Groundwater
COCs: Soil: Arsenic, Aroclor 1260, Carcinogenic PAHs, Dioxin (2,3,7,8-TCDD).
Groundwater: Aldrin, Arsenic, Heptachlor, and Heptachlor Epoxide.

The results of the central tendency evaluation are presented in Appendix E and are summarized below.

For child residents, the central tendency analysis indicates that if average exposure assumptions (e.g., soil ingestion rate of 100 mg/day, a soil-to-skin adherence factor of 0.6 mg/cm²) were used when assessing exposure instead of upperend assumptions (e.g., ingestion rate of 200 mg/day, a soil-to-skin adherence factor of 1.0 mg/cm²), the total HI for a current child resident in Exposure Unit 2 (restricted area north of the school property) would be reduced from 12 to 5. The total HI for a future child resident in Exposure Unit 1 (unrestricted school property) would be reduced from 4 to 1. The total HI for a future child resident exposed to surface soil in Exposure Unit 2 (restricted area north of the school property) would be reduced from 14 to 6, and from 25 to 10 if the child resident was exposed to subsurface soil instead of surface soil.

If average exposure assumptions were used when assessing exposure instead of upperend assumptions, the total incremental lifetime cancer risk for future residents (sum of child and adult risks) in Exposure Unit 1 would be reduced from 1E-04 to 4E-05. The total incremental lifetime cancer risk for current residents (sum of child and adult risks) in Exposure Unit 2 (surface soil) would be reduced from 2E-04 to 3E-05. The total incremental lifetime cancer risk for future residents in Exposure Unit 2 (surface soil) would be

reduced from 2E-04 to 5E-05 if residents were exposed to surface soil and from 4E-04 to 6E-05 if residents were exposed to subsurface soil.

As indicated above, changing the exposure assumptions from upperend (reasonable maximum exposure) to average (central tendency) values did not decrease any of the total HI values below 1, the level of concern for noncarcinogenic hazards. However, all of the resulting cancer risks were decreased below 1E-04, the remediation "trigger."

6.0 Refinement of Contaminants of Concern

As indicated in Sections 2 through 5, uncertainties are inherent in the risk assessment process. Most of these uncertainties result in the potential for overestimation of risk (e.g., the combination of several upper-bound assumptions for some exposure scenarios). The objective of this section is to refine the number of contaminants of concern (COCs) identified in the risk characterization (Tables 10.1 through 10.6) by examining any chemical-specific uncertainties that may exist. This will provide perspective for risk managers when making risk management decisions for the site.

6.1 Soil

A total of 15 chemicals were identified as COCs in on-site soil: aluminum, antimony, aroclor 1260, arsenic, barium, cadmium, carcinogenic PAHs, chromium, copper, dieldrin, iron, lead, manganese, 2,3,7,8-TCDD, and zinc. Most of the COCs identified appear to be site-related COCs; however, additional discussion is warranted for four of the COCs: aluminum, iron, chromium, and dieldrin.

The maximum detected concentration of aluminum in surface soil was 6,300 mg/kg (Table 2.2). The EPA PRG for aluminum is 7,600 mg/kg; therefore, aluminum was eliminated as a COC in surface soil. Aluminum was only detected in one subsurface soil sample at a concentration exceeding the PRG (it was detected at a concentration of 10,000 mg/kg in subsurface soil sample BDSB079). Also, as discussed in Section 4, only a provisional RfD was available for aluminum (provisional toxicity values have not gone through the verification necessary to be placed by EPA on IRIS or HEAST). Hazards associated with chemicals with provisional toxicity values are likely to be overly conservative. Therefore, since the hazard quotients for aluminum are based on a provisional RfD and subsurface soil is not currently available for direct contact, aluminum is not likely to pose a significant threat to receptors at the site.

Iron, another COC identified in soil, is the most common of all metals in the environment. Iron is one of the most important elements in nutrition, although iron toxemia occurs when high levels of iron are consumed. The oral RfD for iron is a provisional value. Most of the quantitative chronic oral toxicity data for iron have been obtained from studies of the Bantu population of South Africa. These studies were based on consumption of iron after drinking beer that was brewed in iron vessels. However, data from the Bantu studies were considered inadequate to determine a LOAEL because of confounding factors. The iron RfD is based on the mean dietary iron intakes, dietary plus supplemental, taken from the NHANES II data base. The highest dose level from the NHANES II study was used as a NOAEL, and the RfD was established on this basis. Additional toxicological data are needed to complete the verification process for

the RfD. As stated above, hazards associated with chemicals with provisional toxicity values are likely to be overly conservative.

Dieldrin, a pesticide, was detected in five of eight surface soil samples collected in Exposure Units 1 and 2. However, the detected concentration of dieldrin in only one of the five samples exceeded the corresponding PRG. Dieldrin has a similar chemical structure to aldrin. Aldrin quickly breaks down to dieldrin in the environment. From 1950 to 1970, aldrin and dieldrin were popular pesticides for crops like corn and cotton. Since the site received ash from municipal solid wastes from 1949 to 1953, the presence of pesticides at the site is likely related to general pest control in the area during the 1950s through the 1970s.

Chromium was identified as a COC in surface and subsurface soil in Exposure Unit 2. As discussed in Subsection 4.2.1.1, this risk assessment assumed that only hexavalent chromium, the more toxic form of chromium, was present at the site. This likely results in some overestimation of risk. Hexavalent chromium is more mobile than trivalent chromium; if hexavalent chromium is detected in soil, it will generally be present in groundwater also. However, as indicated in Table 2.5, chromium was not detected in groundwater. Therefore, it is unlikely that hexavalent chromium is the only form of chromium in the soil. In fact, it is customary to assume that when total chromium is analyzed the ratio of hexavalent chromium to trivalent chromium (the less toxic form of chromium) is 1 to 6. The maximum detected concentrations of chromium in surface soil and subsurface soil were 79 mg/kg and 130 mg/kg, respectively. Both of these concentrations are well below the PRG of 10,000 mg/kg for trivalent chromium. The uncertainty of not knowing the speciation of chromium could be reduced by analyzing samples from areas of concern for hexavalent chromium.

6.2 Groundwater

Seven chemicals were identified as COCs in groundwater: aldrin, aroclor 1016, arsenic, heptachlor, heptachlor epoxide, iron, and manganese. However, the presence of five of these COCs warrant additional discussion.

Three of the seven COCs in groundwater (aldrin, heptachlor, and heptachlor epoxide) were detected in only one groundwater sample (BDMW001). Heptachlor epoxide is an oxidation product of heptachlor. Heptachlor was used extensively in the U.S. until the 1970s to control a variety of insects. From 1950 to 1970, aldrin was a popular pesticide for crops like corn and cotton. Since the site operated from 1949

to 1953 and pesticides were detected in only one well, the presence of pesticides in the groundwater is likely related to general pest control that occurred in the area after the landfill was closed.

Iron was identified as another COC in groundwater. As discussed in Subsection 6.1, iron is an essential element in nutrition. The provisional oral RfD for iron was derived based on the mean dietary iron intakes taken from the NHANES II data base (a NOAEL). Therefore, additional toxicological data are needed to complete the verification process for the RfD. As stated above, hazards associated with chemicals with provisional toxicity values are likely to be overly conservative.

Arsenic was detected in one of 14 groundwater samples analyzed. Arsenic was detected at a concentration of 0.0036 mg/L, which is well below the maximum contaminant level (MCL) of 0.01 mg/L. Aroclor 1016 was detected in two of 17 samples analyzed; however, both detected concentrations (0.001 mg/L and 0.003 mg/L) were above the MCL of 0.0005 mg/L. Based on the low frequency of detection, it is recommended that additional samples be collected to confirm the presence of aroclor 1016 in groundwater.

6.3 Refined List of COCs

Based on the discussions provided in Sections 6.1 and 6.2, the refined lists of COCs for the Brown's Dump site are presented below:

- **Soil:** antimony, aroclor 1260, arsenic, barium, cadmium, carcinogenic PAHs, copper, lead, manganese, 2,3,7,8-TCDD, and zinc.
- **Groundwater:** aroclor 1016 and manganese.

Remedial goal options will be developed for each of these COCs in Section 7.0.

7.0 Remedial Goal Options

This section contains the site-specific RGOs for the chemicals and media of concern at the Brown's Dump site. In accordance with Region 4 guidance (EPA, 1995a), RGOs are included in the baseline risk assessment to provide the Remedial Project Manager with a range of risk-based media cleanup levels options and ARARs as a basis for developing the selected remediation goals in the Feasibility Study and Proposed Plan.

RGOs were developed for chemicals of concern in each land use scenario evaluated in the baseline risk assessment. COCs are chemicals that significantly contribute to a use scenario for a receptor that exceeds a 1E-04 total carcinogenic risk or exceeds a hazard index of 1. Individual chemicals contributing to these scenarios had RGOs developed if their contribution was greater than or equal to 1E-06 for carcinogens or yielded a hazard quotient greater than or equal to 0.1 for noncarcinogens. Using the above criteria and the discussions included in Section 6.0, the appropriate chemicals, exposure units, exposure routes, and receptors for which RGOs were calculated were selected from Tables 9.1 through 9.10.

The site-specific exposure assumptions and models used in the baseline risk assessment were used to develop the RGOs for the Brown's Dump site. This leads to the risk level for a given chemical being directly proportional to the exposure concentration. The following equation was used to calculate the chemical-specific risk-based RGOs:

$$\text{Remediation Goal} = \frac{\text{TR} \times \text{EC}}{\text{CR}}$$

(RG)

Where:

TR = Target Risk Level (HQ equal to 0.1, 1, and 3 for noncarcinogenic effects and risk level equal to 1E-06, 1E-05, and 1E-04 for carcinogenic effects).

EC = EPCs in Soil, Surface Water, and Groundwater (Tables 3.1 through 3.9).

CR = Calculated Risk Level (Tables 10.1 through 10.6).

Tables 12.1 and 12.2 present the media-specific RGOs for the chemicals of concern for each exposure scenario (refer to Subsection 6.3 and Tables 10.1 through 10.6 for the media, scenarios, exposure units, and chemicals of concern which present unacceptable risks and hazards). The derived RGOs reflect the

combined exposure through the applicable routes for any given medium (e.g., for exposure to surface soil, incidental ingestion and dermal contact were combined). The COCs for the Brown's Dump site are listed below:

- **Soil:** antimony, aroclor 1260, arsenic, barium, cadmium, carcinogenic PAHs, copper, lead, manganese, 2,3,7,8-TCDD and zinc.
- **Groundwater:** aroclor 1016 and manganese.

8.0 Summary of the Human Health Risk Assessment for Exposure Units 1 and 2

8.1 Uncertainties Associated With Data Evaluation

A total of 1,198 soil samples were analyzed for lead in the field using XRF. One hundred and twenty-three of these samples were also submitted to a laboratory for confirmatory analysis. Of the 123 samples that had both XRF and laboratory results, 23 percent (28 samples) had the same results, 61 percent (75 samples) had lab results greater than the corresponding XRF readings, and 16 percent (20 samples) had XRF readings greater than the corresponding lab results.

The XRF and laboratory readings were different for 95 samples. For these samples, the higher result was generally between 1.2 and 1.9 times greater than the lower number (70 of the 95 samples fell in this category). For example, sample BDSBO36 had an XRF reading of 64.7 mg/kg and a laboratory reading of 90 mg/kg. For this sample, the laboratory result was 1.4 times higher than the XRF reading (i.e., $90/64.7$ is equal to 1.4).

The comparison of the results for these 95 samples is presented below.

| Difference Between Lab and XRF Reading | Number of Lab Results That Were Higher Than XRF Results | Number of XRF Results That Were Higher Than Lab Results |
|---|--|--|
| 1.2 - 1.9 X | 53 | 17 |
| 2.0 - 2.9 X | 16 | 2 |
| 3.0 - 3.9 X | 2 | 0 |
| 4.0 - 4.9 X | 1 | 0 |
| 5.0 - 5.9 X | 1 | 0 |
| 6.0 - 6.9 X | 1 | 0 |
| 7.0 - 7.9 X | 0 | 0 |
| 8.0 - 8.9 X | 0 | 0 |
| 9.0 - 9.9 X | 1 | 0 |
| > 10 X | 0 | 1 |
| TOTALS | 75 | 20 |

When two results were reported for a sample (an XRF and a laboratory result), the higher of the two results was used in the risk assessment.

Since most samples were only analyzed by XRF, the reported results may underestimate the concentrations of lead at the site since laboratory results were higher than XRF results in more than 60 percent of the samples that were confirmed in the laboratory (laboratory results were higher than XRF results in 75 of 123 samples). As indicated in the table above, the laboratory result for a sample was 1.2 to 1.9 times higher than the corresponding XRF result in 53 of 145 samples (43 percent). Twenty-two of 123 samples (18 percent) had laboratory results that were more than 2 times higher than the corresponding XRF result.

As previously discussed, EPA expects XRF measurements between 200 mg/kg and 400 mg/kg to be confirmed by laboratory analysis. EPA further evaluated the XRF and laboratory data for lead to ensure that XRF lead measurements below 200 mg/kg are not actually above 400 mg/kg. The evaluation indicated an error of 1.7 percent when XRF lead measurements under 200 mg/kg were compared with corresponding lead measurements exceeding 400 mg/kg. Therefore, EPA anticipates a 98 percent confirmation rate that no sample with a concentration above 400 mg/kg is missed.

XRF results for three surface soil samples (sample BD-SS-08 in Exposure Unit One, and samples BDSB079 and BDSB083 in Exposure Unit Two) were in the 200 mg/kg to 400 mg/kg range.

A limited number of groundwater samples were collected at the Brown's Dump site. All groundwater samples collected during the RI had nephelometric turbidity unit (NTU) readings of 10 or less. However, the turbidity readings in the groundwater samples collected during the ESI ranged from 15 to 16 NTUs. Also, the turbidimeter malfunctioned at two sampling locations during the ESI; therefore, turbidity readings were not obtained for these groundwater samples. Highly turbid samples may contain elevated concentrations of inorganic constituents. In general, groundwater samples collected during the ESI contained concentrations of metals that were approximately 1,000 times higher than those collected during the RI. Therefore, the risk assessment concluded that the ESI results for the inorganic constituents may be inaccurate because of turbidity and the results were excluded from the risk assessment (analytical results for the organic compounds were included in the risk assessment). This may lead to an underestimation of risk from exposure to groundwater.

Metals are generally compared to site-specific background concentrations when selecting COPCs for a site. If the maximum detected concentration of an inorganic chemical is less than two times the mean background concentration, the chemical is excluded as a COPC in that medium. Although samples were collected during the RI field investigation to serve as background samples for the Brown's Dump site,

inorganic compounds detected in soil were not screened against the background samples due to the uncertainty associated with obtaining “true” background samples from this area (i.e., the boundaries of the ash had not been delineated). Therefore, no metal was excluded as a COPC in soil based on a comparison with background. This may result in an overestimation of risk.

Fifty-three dioxin samples analyzed by Draft Screening Method 4425 were not used in the baseline risk assessment because of uncertainty associated with the analytical method. This may lead to an under- or overestimation of risk.

Inorganic soil and water samples at the Brown’s Dump site were analyzed using Trace Inductively Coupled Plasma (ICP). However, EPA Region 4 has determined that using ICP for low levels of arsenic, selenium, and thallium analyses may result in false positive results. Therefore, any future lab analyses should use an alternative analytical method such as Inductively Coupled Plasma - Mass Spectroscopy (ICP-MS) to achieve lower detection limits.

8.2 Chemicals of Potential Concern

COPCs in on-site surface and subsurface soils included metals, carcinogenic PAHs, dioxins, dieldrin, and aroclor 1260. Although several volatile organic compounds were detected in on-site surface and subsurface soils, the detected concentrations were all well below the applicable screening levels. Therefore, volatile organic compounds were eliminated as COPCs in soil.

COPCs in groundwater included metals, pesticides, and aroclor 1016. No VOCs were detected in groundwater. Dioxins were detected in one out of three groundwater samples; however, the detected concentration was below the applicable screening level.

Metals were the only COPCs in surface water. Human exposure to sediment in Moncrief Creek was not quantitatively evaluated in this baseline risk assessment; however, exposure to sediment by ecological receptors will be evaluated in the ecological risk assessment.

8.3 Exposure/Toxicity Assumptions

Site-specific exposure information was unavailable; therefore, EPA default values and professional judgment were used to select exposure assumptions for the various receptors evaluated in the risk assessment. These exposure assumptions are likely to overestimate hazards and risks.

Hazards associated with chemicals with provisional toxicity values are likely to be overly conservative; therefore, care should be taken before making any remedial decisions based on these metals. The risk assessment assumed that 100 percent of the chromium detected in soil was hexavalent chromium. This is likely to overestimate risk from exposure to chromium.

8.4 Risks and Hazards

Calculated risks and hazards were below applicable thresholds (a total HI greater than 1 and an incremental excess lifetime cancer risk of 1E-04) for current residents exposed to surface soil in Exposure Unit 1 (unrestricted school property) and surface water in Moncrief Creek. However, current residents exposed to surface soil in Exposure Unit 2 (restricted area north of the school) and surface water had a total HI value that exceeded 1 and total incremental lifetime cancer risk that exceeded 1E-04.

Calculated risks and hazards were all above applicable thresholds (a total HI greater than 1 and a cumulative excess lifetime cancer risk of 1E-04) for future residents (the future scenario included evaluation of exposure to groundwater).

8.5 Contaminants of Concern and Remedial Goal Options

The risk characterization identified a total of 15 chemicals as COCs in on-site soil: aluminum, antimony, aroclor 1260, arsenic, barium, cadmium, carcinogenic PAHs, chromium, copper, dieldrin, iron, lead, manganese, 2,3,7,8-TCDD, and zinc. Seven chemicals were identified as COCs in groundwater: aldrin, aroclor 1016, arsenic, heptachlor, heptachlor epoxide, iron, and manganese. No COCs were identified in Moncrief Creek.

The hazards and risks presented in the risk characterization are not absolute estimates of risk that would result from exposure to the environmental media at the site. Uncertainties are inherent in the risk assessment process. Most of these uncertainties result in the potential for overestimation of risk. To provide perspective for risk managers, the number of COCs identified in the risk characterization (listed above) was refined by examining any chemical-specific uncertainties that may exist. Based on this examination, the lists of COCs for Area 1 of the Brown's Dump site were refined to include the following:

- **Soil:** antimony, aroclor 1260, arsenic, barium, cadmium, carcinogenic PAHs, copper, lead, manganese, 2,3,7,8-TCDD, and zinc.
- **Groundwater:** aroclor 1016 and manganese.

8.6 Remedial Goal Options

In accordance with Region 4 guidance (EPA, 1995a), RGOs were included in the baseline risk assessment to provide the Remedial Project Manager with a range of risk-based media cleanup levels options and ARARs as a basis for developing the selected remediation goals in the Feasibility Study and Proposed Plan. Site-specific RGOs were developed for the refined list of COCs in soil and groundwater at the Brown's Dump site. RGOs were developed for a range of target risk levels (HQ equal to 0.1, 1, and 3 for noncarcinogenic effects and risk level equal to 1E-06, 1E-05, and 1E-04 for carcinogenic effects).

Soil lead concentrations greater than 400 mg/kg in residential areas should be considered a potential health threat. The degree of threat depends on the bioavailability of the lead. Due to the concentration of lead in soil, exposure to lead at the site may present a significant risk to receptors at the site if incidental ingestion occurs. Detected concentrations of lead in groundwater were less than EPA's action level of 15 ug/L.

Examination of the distribution and detected concentrations of COCs revealed a trend in the EU1 and EU2 surface soil samples. Generally whenever a soil sample presents an unacceptable risk or hazard (i.e., COCs are identified and RGOs are calculated), ash is visible at that location or lead is present at concentrations exceeding 400 mg/kg, EPA's screening value for residential soil. Figure 8-1 shows the primary COPCs in surface soil in EU1 and EU2. Detected concentrations of COPCs that exceed their chemical-specific RGO (corresponding to a cancer risk of 1E-06 or a HQ of 1) are in bold print. With the exception of three locations, lead was detected at concentrations exceeding 400 mg/kg at each surface soil location where a chemical-specific RGO was exceeded. However, carcinogenic PAHs were detected at concentrations of 0.1 mg/kg and 0.28 mg/kg in samples BD-SS-09 and BD-SS-07, respectively. These concentrations exceed the RGO of 0.09 mg/kg. Lead was detected at concentrations well below 400 mg/kg at both of these locations. In addition, aroclor 1260 and carcinogenic PAHs were detected at concentrations exceeding their respective RGOs in sample BD-SS-10; lead was detected at only 51 mg/kg in this sample.

8.7 Data Gaps

The following data gaps were identified based on the results of the baseline risk assessment:

- Subsurface soil samples should be collected from EU1 (unrestricted school property). At least one subsurface soil sample should be analyzed for full scan TCL/TAL parameters.
- Confirmatory analyses may be required for the three surface soil sample locations with lead

- Confirmatory analyses may be required for the three surface soil sample locations with lead concentrations between 200 and 400 mg/kg (see Figure 8-1).
- Additional groundwater samples should be collected from the site to confirm the presence or absence of site-related COPCs.

8.8 Evaluation of Residential Areas

Appendix B contains the evaluation of risks and hazards resulting from exposure to COPCs in the residential areas.

9.0 References

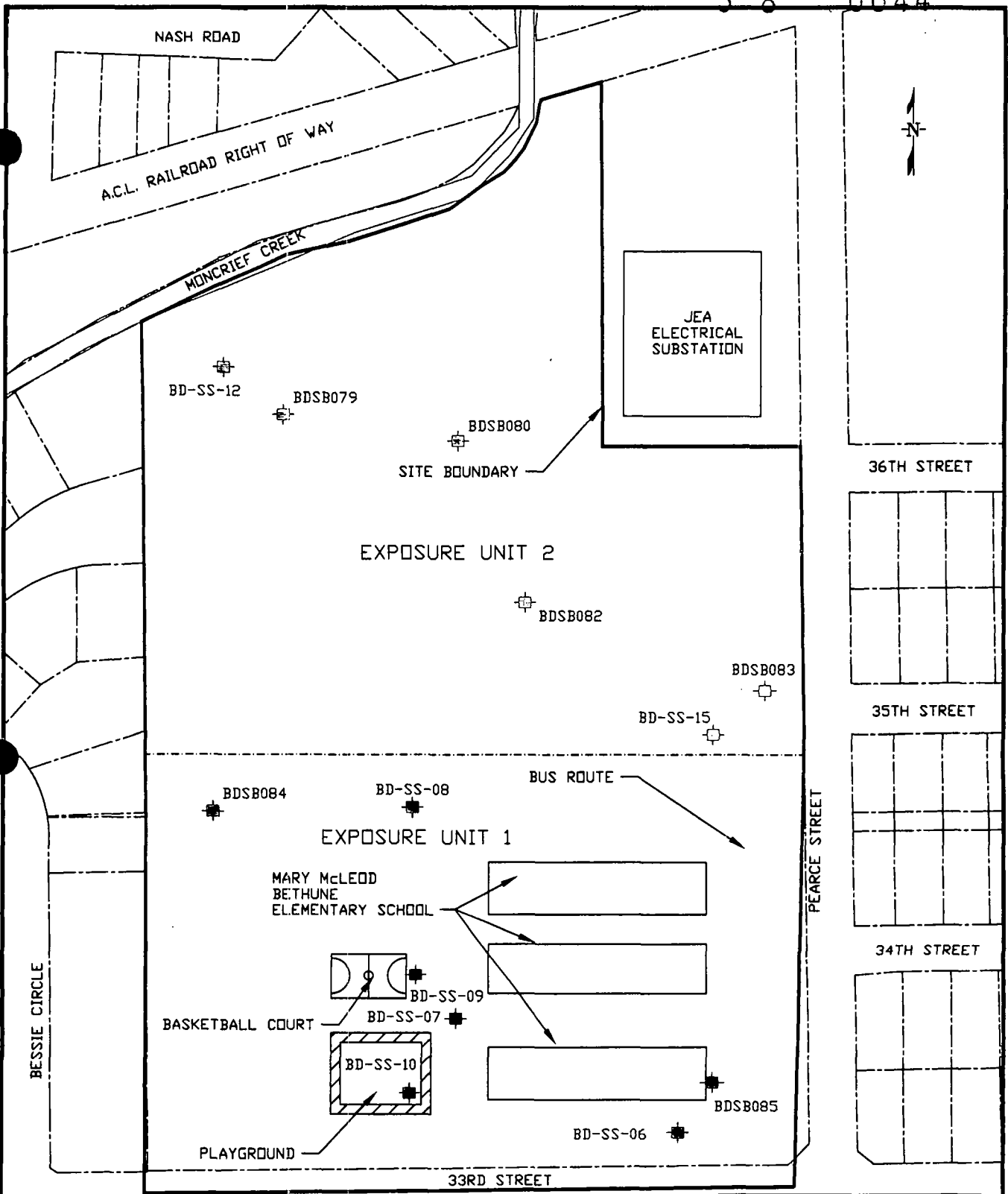
1. Agency for Toxic Substances and Disease Registry (ATSDR), 1995. Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHs). Atlanta, Georgia.
2. ATSDR, 1999. ATSDR, Toxicological Profile for Lead Update, PB/99/166704.
3. Black & Veatch. 1995. Letter and attachments to Lesley Keck, Black & Veatch, from Rusty Newman of United Water Florida. Regarding the Well Locations and Service of United Water Florida. December 18
4. Black & Veatch. 1995. Record of Telephone Conversation Regarding the Jacksonville Public Utilities (JPU) Service Connections. Between Lesley Keck, Black & Veatch, and Ray Turknett, JPU. December 12.
5. CH2M Hill team, 1999. Draft Work Plan for the Remedial Investigation Feasibility Study for Browns Dump Site, December.
6. Dermal Exposure Assessment: Principals and Applications, U.S. Environmental Protection Agency, January 1992.
7. EMCON. 1995. "Contamination Assessment Report. Prepared for the Duval County School Board. Project 71355.020.010.0003. November.
8. EMCON. 1996. "Health Evaluation of Browns Dump." Prepared for the City of Jacksonville. Project 71286-001.090. July.
9. Exposure Factors Handbook, U.S. Environmental Protection Agency, August, 1997.
10. Florida Department of Health, 1997. Health Consultation Browns Dump, Jacksonville, Duval County, Florida, February 6.
11. Florida Department of Environmental Protection. 1996. Preliminary Assessment Report, 5th and Cleveland Incinerator, AKA: Emmett Reed Park & Community Center, Duval County, Florida. By James McCarthy, Jr., Division of Waste Management. October 31.
12. JPU. 1995. City of Jacksonville, Water Division North and South Grid Water Treatment Facility and Well Locations. October.
13. National Recommended Water Quality Criteria - Correction, U.S. Environmental Protection Agency, April 1999b.

14. National Oceanic and Atmospheric Administration, Local Climatological Data Annual Summary with Comparable Data, Charleston, South Carolina, National Climatological Center, Asheville, North Carolina, 1981.
15. Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites, U.S. Environmental Protection Agency, February, 1985.
16. Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual (Part A), U.S. Environmental Protection Agency, December, 1989.
17. Site Visit Conducted on December 1999. Attended by representatives from EPA Region 4, FDEP, and Black & Veatch Special Projects Corp.
18. Standard Default Exposure Factors, U.S. Environmental Protection Agency, March, 1991.
19. Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, U.S. Environmental Protection Agency, Region 4, October, 1995a.
20. Tetra Tech EM, Inc. 1998. "Expanded Site Inspection Browns Dump." Prepared for EPA. March.
21. U.S. Census Bureau, Population Estimates Program, Population Division, Washington, D.C. 20233, Internet release date Sept. 30, 1999.
22. U.S. Census Bureau, 1997 Economic Census: Summary Statistics for Jacksonville, FL 1997 NAICS Basis.
23. U.S. EPA, 2000a. Integrated Risk Information System, November 2000.
24. U.S. EPA, 2000b. Letter to David A. Ludder, Legal Environmental Assistance Foundation, from H. Glenn Adams, Risk Assessment Specialist, U.S. EPA, Region 4. October 11.
25. U.S. EPA, 2000c. Preliminary Remediation Goals, Region 9, November.
26. U.S. EPA, 1995b. "Site Investigation Of Browns Dump" Roy F. Weston, Inc. EPA Technical Assistance Team, May 16.
27. U.S. EPA. 1985. "Preliminary Assessment, Brown's Dump." September 10.
28. U.S. EPA. 1985. Site Screening Investigation, Browns Dump." Environmental Services Division Project Number 86E-168. November.

29. U.S. Department of Commerce. Rainfall Frequency Atlas of the United States, Technical Paper Number 40 (Washington, D.C.: GPO, 1961), excerpt 3 pages.
30. U.S. Department of Commerce, *Climatic Atlas of the United States*, Washington, D.C.: GPO, June 1968. Reprint: 1983, National Oceanic and Atmospheric Administration.
31. U.S. Geological Survey. 7.5-minute Quadrangle Maps of Florida. Arlington 1963 (Photo revised [PR] 1992). Dinsmore 1964 (PR 1984). Eastport (PR 1992). Jacksonville (PR 1992). Marietta 1964 (PR 1992). Trout River 1964 (PR 1982). Scale 1:24,000.

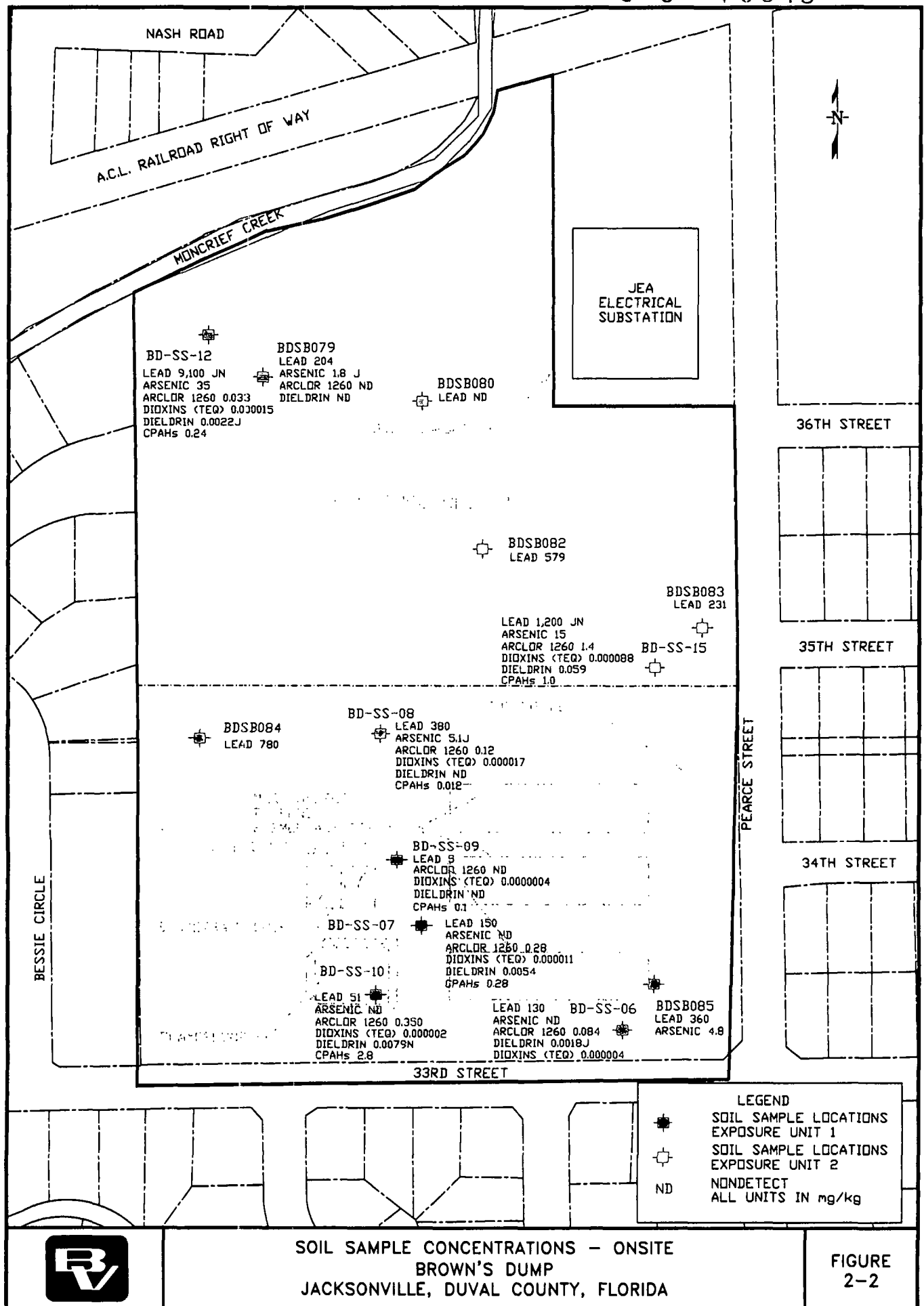
3 8 0043

FIGURES



SOIL SAMPLE LOCATIONS - ONSITE
BROWN'S DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

FIGURE
2-1



SOIL SAMPLE CONCENTRATIONS - ONSITE
BROWN'S DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

FIGURE
2-2

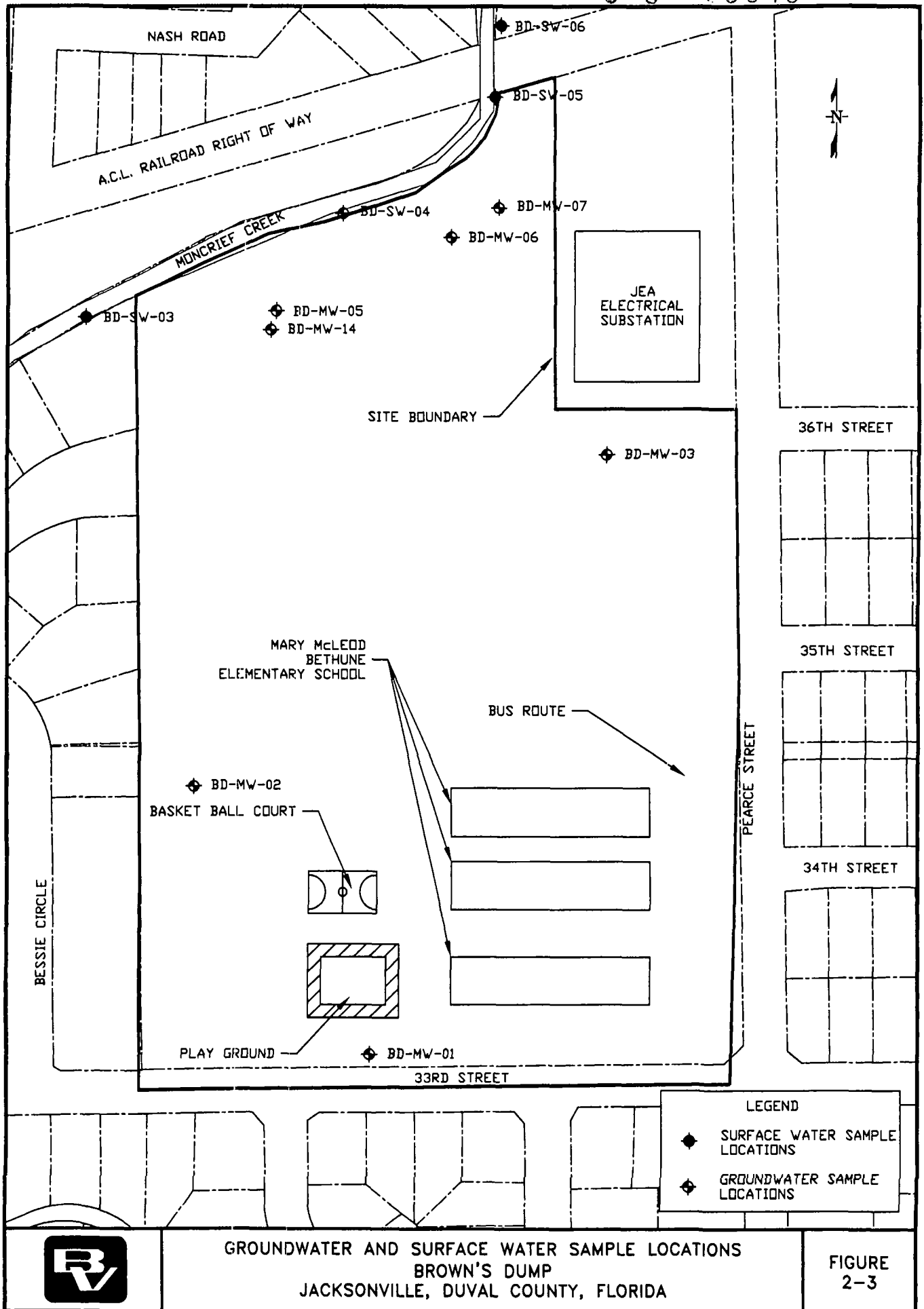
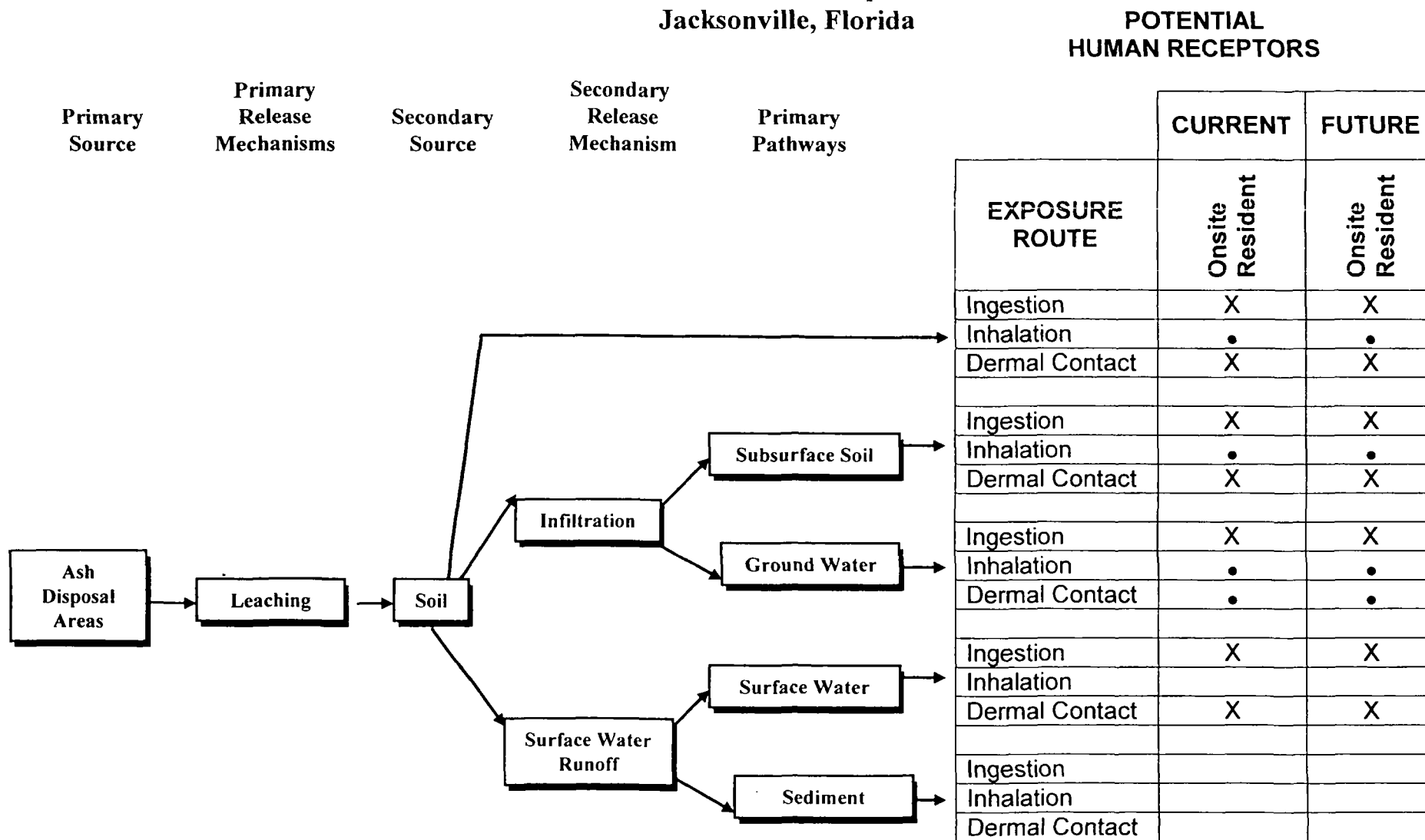


Figure 3-1
Human Health Conceptual Site Model
Brown's Dump
Jacksonville, Florida



X Pathway was quantitatively evaluated
 • Pathway was qualitatively evaluated

3 8 . 0047

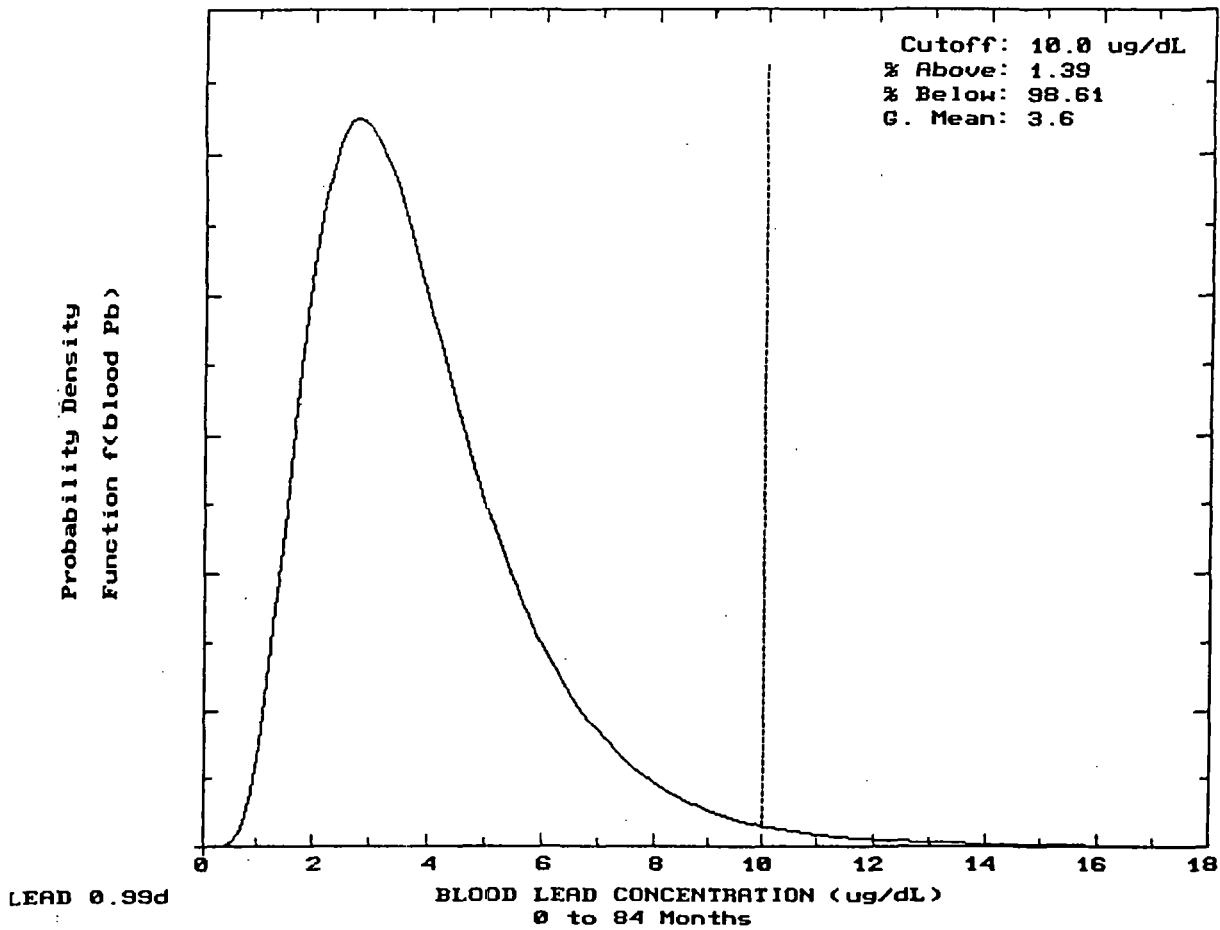


Figure 5-1

Probability Density Function Graph of Hypothetical Mean Blood Lead Level in 0-7 Year Old Current Child Resident Within Exposure Unit 1 (Surface Soil 179 mg/kg) at the Brown's Dump Site in Jacksonville, Florida.

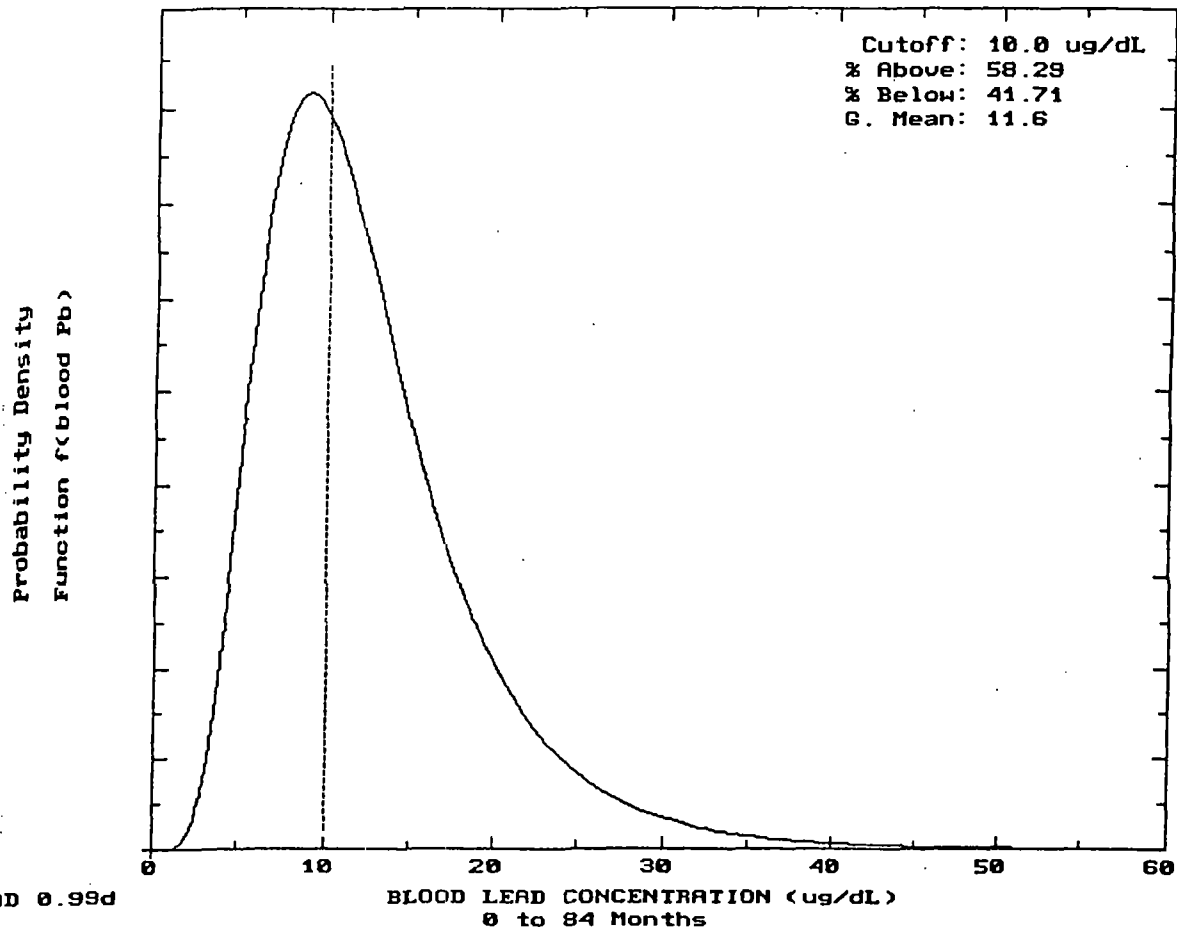


Figure 5-2

Probability Density Function Graph of Hypothetical Mean Blood Lead Level in 0-7 Year Old Current Child Resident Within Exposure Unit 2 (Surface Soil 2,263 mg/kg) at the Brown's Dump Site in Jacksonville, Florida.

3 8 . 0050

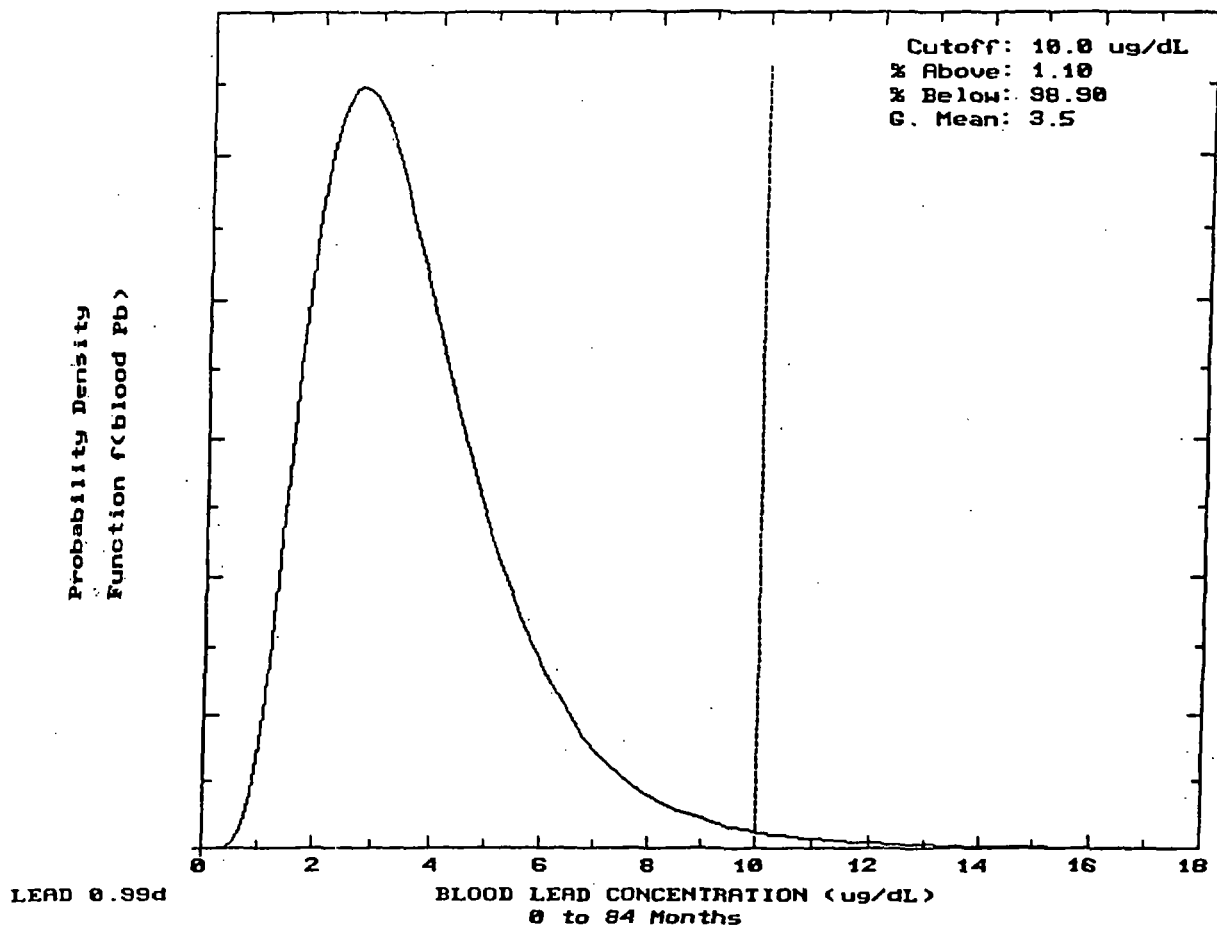


Figure 5-3

Probability Density Function Graph of Hypothetical Mean Blood Lead Level in 0-7 Year Old Future Child Resident Within Exposure Unit 1 (Surface Soil Concentration of 179 mg/kg and Groundwater Concentration of 2 $\mu\text{g/L}$) at the Brown's Dump Site in Jacksonville, Florida.

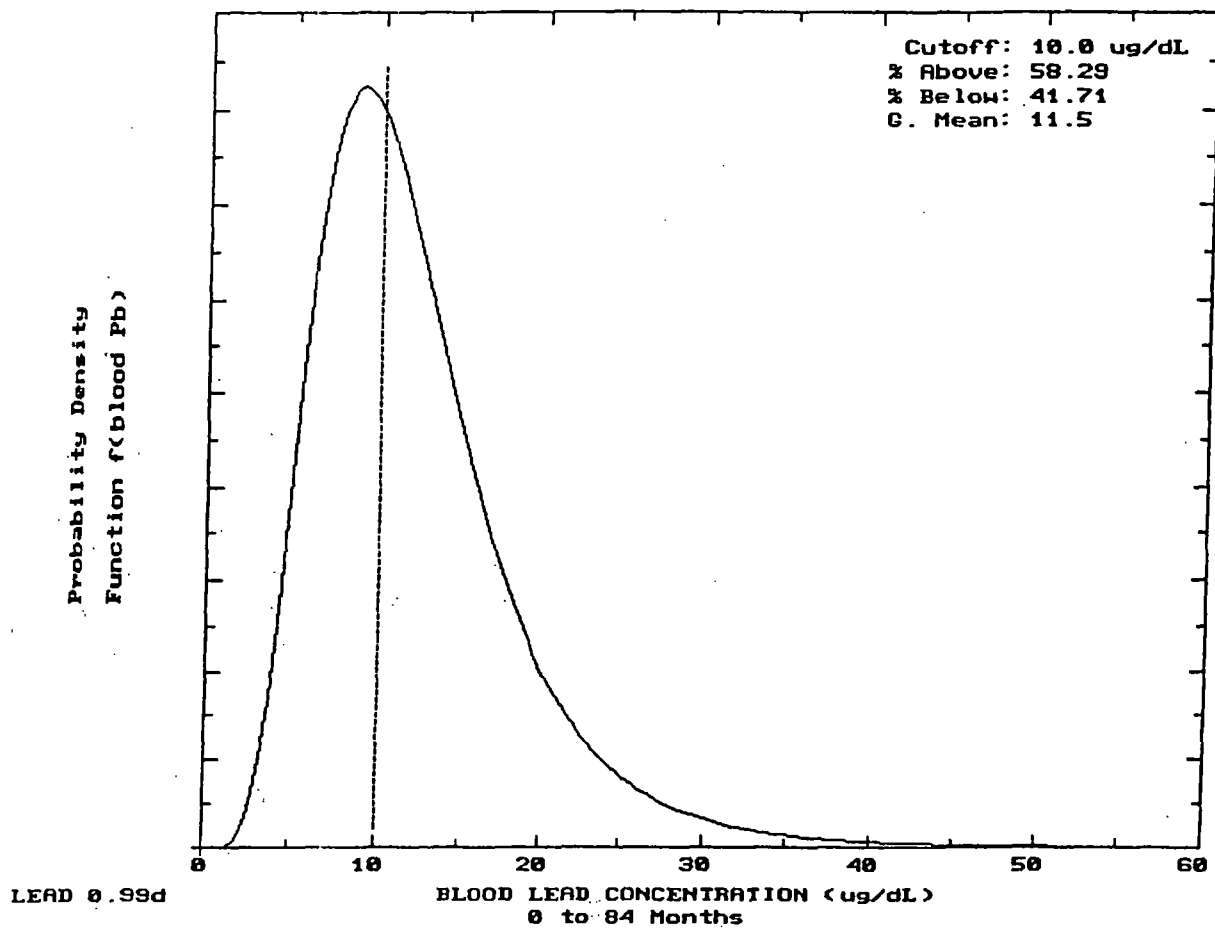
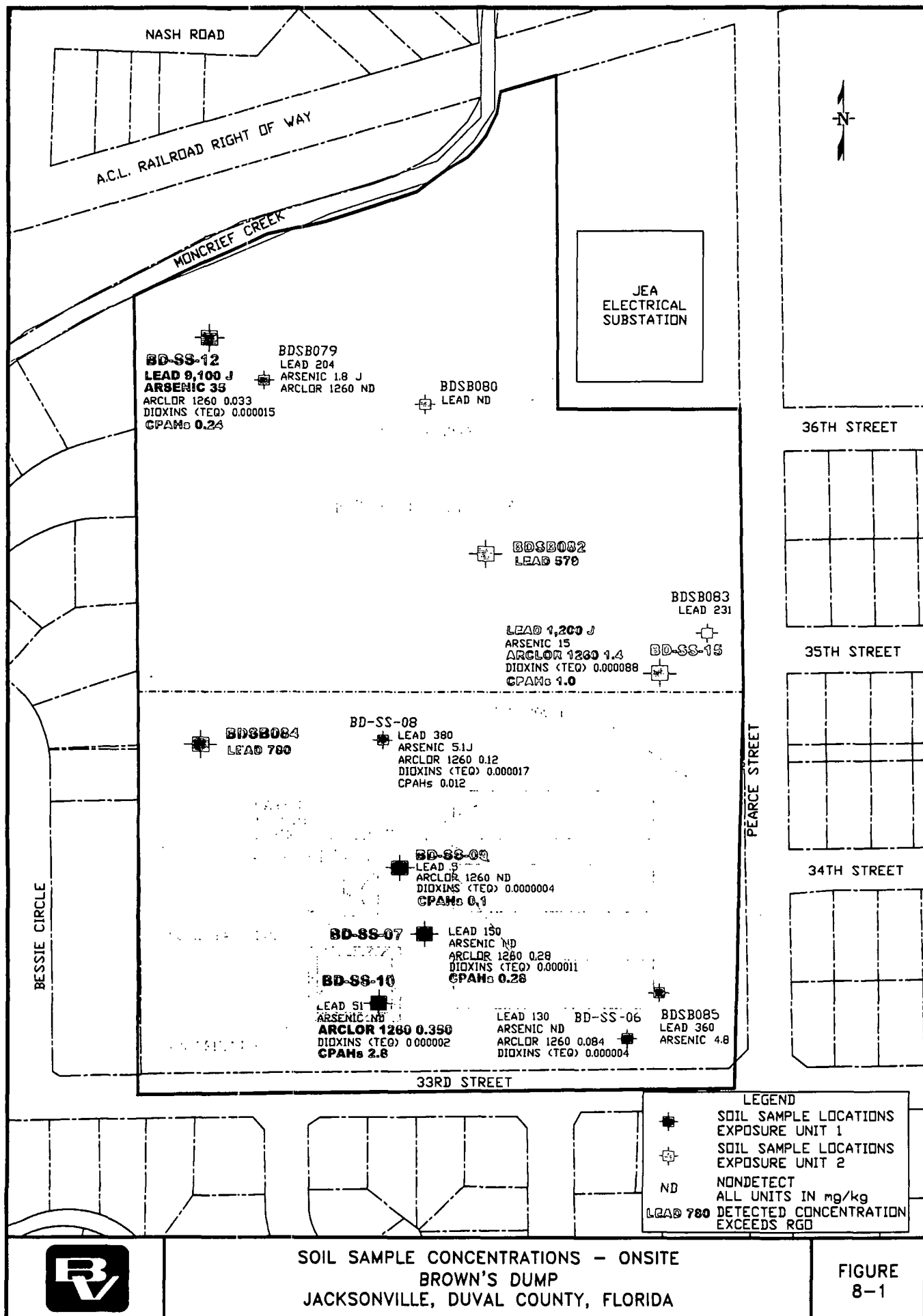
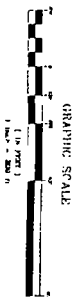



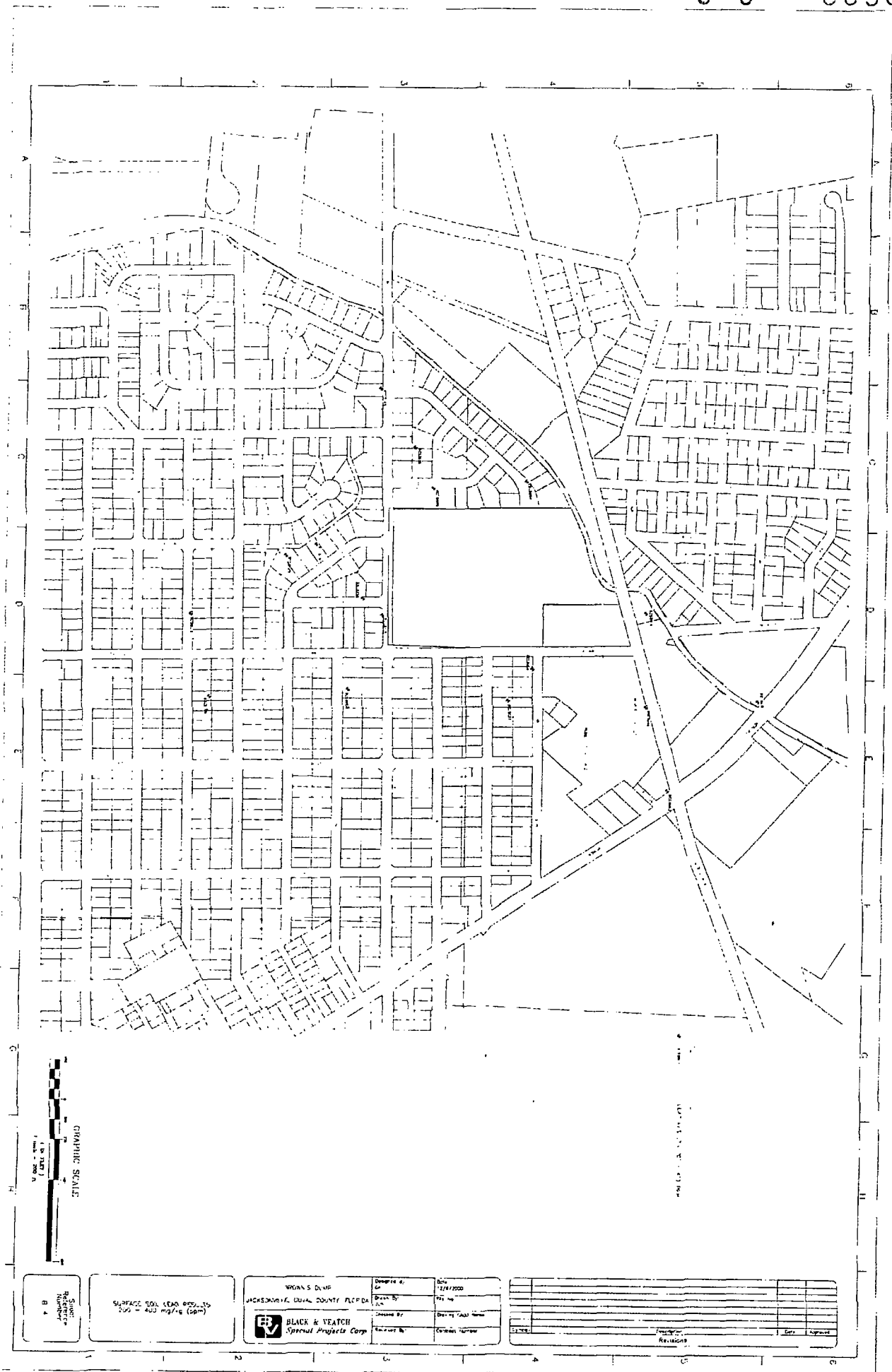
Figure 5-4

Probability Density Function Graph of Hypothetical Mean Blood Lead Level in 0-7 Year Old Future Child Resident Within Exposure Unit 2 (Surface Soil Concentration of 2,263 mg/kg and Groundwater Concentration of 2 $\mu\text{g/L}$) at the Brown's Dump Site in Jacksonville, Florida.





| | | | |
|--|--|---|---|
|  BLACK & VEATCH <i>Special Projects Corp.</i> | BROAD'S DAMP WILMINGTON, DELAWARE COUNTY, FLORIDA | Drawn By: Date: 12/1/2005 Check By: Project No: Revision: Scale: Sheet No: Total Sheets: | Project Name: Client: Location: Date: Approval: |
| | SURFACE SOIL LOAD RESULTS (1750 LBS/FT ² (80 kPa)) | Project No: Date: Project Name: Client: Location: Date: Approval: | |



GRAPHIC SCALE
1" = 200' A

| | | | |
|---|--|------------------------------|----------------------------|
| <p>BLACK & VEATCH Special Projects Corp.</p> | <p>WORMS DAM HICKORY, DUAL COUNTY, FLORIDA</p> | <p>Designed by: C.V.</p> | <p>Date: 12/1/2000</p> |
| | <p>Checked by: J.W.</p> | <p>Date: 12/1/2000</p> | <p>Drawn by: J.W.</p> |
| | <p>Reviewed by: C.V.</p> | <p>Date: 12/1/2000</p> | <p>Drawn by: J.W.</p> |
| | <p>Approved by: C.V.</p> | <p>Date: 12/1/2000</p> | <p>Drawn by: J.W.</p> |

SURFACE SOIL LEAD RESULTS
500 - 400 mg/kg (ppm)



BROWN, RUPP
JACKSONVILLE, FLORIDA COUNTY, FLORIDA

BLACK & VEATCH
Special Projects Corp.

| | |
|-------------|-----------------|
| Designed By | Date |
| Drawn By | 12/8/2000 |
| Checked By | J. A. |
| Reviewed By | Eng'g CAD Dept |
| Approved By | Customer Number |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | </ |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|

APPENDIX A

Risk Assessment Tables

TA
SELECTION OF EXPOSURE PATHWAYS
BROWN'S DUMP
JACKSONVILLE, FLORIDA

| Scenario Timeframe | Medium | Exposure Medium | Exposure Point | Receptor Population | Receptor Age | Exposure Route | Onsite/ Offsite | Type of Analysis | Rationale for Selection or Exclusion of Exposure Pathway |
|-----------------------|--------------|--------------------|------------------------------------|------------------------|-----------------|---------------------|--------------------|---------------------|---|
| Current | Surface soil | Surface soil | Unrestricted School Property | Resident | Adult | Ingestion Dermal | Onsite | Quant Quant | Hypothetical adult residents may be exposed to contaminants in surface soil. |
| | | | | | Child | Ingestion Dermal | | Quant Quant | Hypothetical child residents may be exposed to contaminants in surface soil. |
| | | | Restricted Area North of School | Resident | Adult | Ingestion Dermal | Onsite | Quant Quant | Hypothetical adult residents may be exposed to contaminants in surface soil. |
| | | | | | Child | Ingestion Dermal | | Quant Quant | Hypothetical child residents may be exposed to contaminants in surface soil. |
| | | Air | Unrestricted School Property | Resident | Adult | Inhalation | Onsite | Qual | Hypothetical adult residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions. |
| | | | | | Child | Inhalation | | Qual | Hypothetical child residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions. |
| | | | Restricted Area North of School | Resident | Adult | Inhalation | Onsite | Qual | Hypothetical adult residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions. |
| | | | | | Child | Inhalation | | Qual | Hypothetical child residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions. |
| | | Surface water | Moncrief Creek | Resident | Adult | Dermal Ingestion | Onsite | Quant Quant | Hypothetical adult residents may be exposed to contaminants in Moncrief Creek while using it for recreational purposes. |
| | | | | | Child | Dermal Ingestion | | Quant Quant | Hypothetical child residents may be exposed to contaminants in Moncrief Creek while using it for recreational purposes. |
| Future | Soil | Surface soil | Unrestricted School Property | Resident | Adult | Dermal Ingestion | Onsite | Quant Quant | Hypothetical adult residents may be exposed to contaminants in surface soil. |
| | | | | | Child | Dermal Ingestion | | Quant Quant | Hypothetical child residents may be exposed to contaminants in surface soil. |
| | | | Restricted Area North of School | Resident | Adult | Dermal Ingestion | Onsite | Quant Quant | Hypothetical adult residents may be exposed to contaminants in surface soil. |
| | | | | | Child | Dermal Ingestion | | Quant Quant | Hypothetical child residents may be exposed to contaminants in surface soil. |
| | | Subsurface soil | Unrestricted School Property | Resident | Adult | Dermal Ingestion | Onsite | Quant Quant | Hypothetical adult residents may be exposed to contaminants in subsurface soil brought to the surface during construction activities. |
| | | | | | Child | Dermal Ingestion | | Quant Quant | Hypothetical child residents may be exposed to contaminants in subsurface soil brought to the surface during construction activities. |
| | | | Restricted Area North of School | Resident | Adult | Dermal Ingestion | Onsite | Quant Quant | Hypothetical adult residents may be exposed to contaminants in subsurface soil brought to the surface during construction activities. |
| | | | | | Child | Dermal Ingestion | | Quant Quant | Hypothetical child residents may be exposed to contaminants in subsurface soil brought to the surface during construction activities. |
| | | Air | Unrestricted School Property | Resident | Adult | Inhalation | Onsite | Qual | Hypothetical adult residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions. |
| | | | | | Child | Inhalation | | Qual | Hypothetical child residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions. |
| | | | Restricted Area North of School | Resident | Adult | Inhalation | Onsite | Qual | Hypothetical adult residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions. |
| | | | | | Child | Inhalation | | Qual | Hypothetical child residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions. |

380059

TABLE
SELECTION OF EXPOSURE PATHWAYS
BROWN'S DUMP
JACKSONVILLE, FLORIDA

| Scenario Timeframe | Medium | Exposure Medium | Exposure Point | Receptor Population | Receptor Age | Exposure Route | Onsite/ Offsite | Type of Analysis | Rationale for Selection or Exclusion of Exposure Pathway |
|-----------------------|---------------|--------------------|----------------------------|------------------------|-----------------|---------------------|--------------------|---------------------|---|
| | Groundwater | Groundwater | Tap Water | Resident | Adult | Ingestion Dermal | Onsite | Quant Qual | Hypothetical residents may install a private well onsite. |
| | | | | | Child | Ingestion Dermal | | Quant Qual | Hypothetical residents may install a private well onsite. |
| | | Air | Water Vapors at Showerhead | Resident | Adult | Inhalation | Onsite | Qual | Hypothetical residents may install a private well onsite. |
| | | | | | Child | Inhalation | | Qual | Hypothetical residents may install a private well onsite. |
| | Surface Water | Surface Water | Moncrief Creek | Resident | Adult | Ingestion Dermal | Onsite | Quant Quant | Hypothetical adult residents may be exposed to contaminants in Moncrief Creek while using it for recreational purposes. |
| | | | | | Child | Ingestion Dermal | | Quant Quant | Hypothetical child residents may be exposed to contaminants in Moncrief Creek while using it for recreational purposes. |

T
OCCURRENCE, DISTRIBUTION AND SELECTED OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|-------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Unrestricted School Property* |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-------------------------------|---------------------------|-------------------|---------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|----------------------|------------------------------|--------------------------|---------------------------|-----------|---|
| 83329 | Acenaphthene | 500 | J | 500 | J | ug/kg | BDSS10 | 1/5 | 360 - 420 | 500 | NA | 370,000 | N | | NO | BSL |
| 120127 | Anthracene | 38 | J | 800 | J | ug/kg | BDSS10 | 2/5 | 370 - 420 | 800 | NA | 2,200,000 | N | | NO | BSL |
| 56553 | Benzo(a)anthracene | 46 | J | 2,100 | J | ug/kg | BDSS10 | 2/5 | 120 - 420 | 2,100 | NA | 620 | C | | YES | ASL, CPAH |
| 205992 | Benzo(b and/or k)fluoranthene | 60 | J | 3,500 | J | ug/kg | BDSS10 | 3/5 | 420 - 420 | 3,500 | NA | 620 | C | | YES | ASL, CPAH |
| | Benzo(ghi)Perylene | 110 | J | 1,000 | J | ug/kg | BDSS10 | 2/5 | 370 - 420 | 1,000 | NA | 2,300,000** | C | | NO | BSL |
| 50328 | Benz(a)pyrene | 83 | J | 1,900 | J | ug/kg | BDSS10 | 3/5 | 420 - 420 | 1,900 | NA | 62 | C | | YES | ASL, CPAH |
| 117817 | Bis(2-Ethylhexyl)Phthalate | 470 | J | 1,200 | J | ug/kg | BDSS10 | 2/5 | 360 - 370 | 1,200 | NA | 35,000 | C | | NO | BSL |
| 86748 | Carbazole | 48 | J | 810 | J | ug/kg | BDSS10 | 2/5 | 370 - 420 | 810 | NA | 24,000 | C | | NO | BSL |
| 218019 | Chrysene | 44 | J | 2,300 | J | ug/kg | BDSS10 | 3/5 | 420 - 420 | 2,300 | NA | 62,000 | C | | YES | CPAH |
| 132649 | Dibenzofuran | 320 | J | 320 | J | ug/kg | BDSS10 | 1/5 | 360 - 420 | 320 | NA | 29,000 | N | | NO | BSL |
| 206440 | Fluoranthene | 72 | J | 7,200 | J | ug/kg | BDSS10 | 3/5 | 420 - 420 | 7,200 | NA | 230,000 | N | | NO | BSL |
| 86737 | Fluorene | 470 | J | 470 | J | ug/kg | BDSS10 | 1/5 | 360 - 420 | 470 | NA | 260,000 | N | | NO | BSL |
| 103395 | Indeno (1,2,3-cd) pyrene | 110 | J | 1,100 | J | ug/kg | BDSS10 | 2/5 | 370 - 420 | 1,100 | NA | 620 | C | | YES | ASL, CPAH |
| 91203 | Naphthalene | 120 | J | 120 | J | ug/kg | BDSS10 | 1/5 | 360 - 420 | 120 | NA | 5,600 | N | | NO | BSL |
| 85018 | Phenanthrene | 160 | J | 5,600 | J | ug/kg | BDSS10 | 3/5 | 420 - 420 | 5,600 | NA | 2,000,000** | N | | NO | BSL |
| 108952 | Phenol | 40 | J | 40 | J | ug/kg | BDSS09 | 1/5 | 360 - 1,000 | 40 | NA | 900** | N | | NO | BSL |
| 129000 | Pyrene | 82 | J | 4,100 | J | ug/kg | BDSS10 | 3/5 | 420 - 420 | 4,100 | NA | 230,000 | N | | NO | BSL |
| 60571 | Dieldrin | 1.8 | J | 7.8 | N | ug/kg | BDSS10 | 3/5 | 3.5 - 3.7 | 7.8 | NA | 30 | C | | NO | BSL |
| 76448 | Heptachlor | 1.1 | J | 1.1 | J | ug/kg | BDSS07 | 1/5 | 1.8 - 2.2 | 1.1 | NA | 110 | C | | NO | BSL |
| 11096825 | PCB-1260 (Aroclor 1260) | 84 | | 350 | | ug/kg | BDSS10 | 4/5 | 37 - 37 | 350 | NA | 220 | C | | YES | ASL |

*This area includes samples BDSS06, BDSS07, BDSS08, BDSS09, BDSS10, BDB84, and BDB85.

**The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration
- (2) Background concentrations are not being used for this evaluation.
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
- (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
- (5) Rationale Codes Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
 - Frequent Detection (FD)
 - Toxicity Information Available (TX)
 - Above Screening Levels (ASL)
 - Carcinogenic PAHs evaluated as a group (CPAH)
- Deletion Reason:
- Infrequent Detection (IFD)
 - Background Levels (BKG)
 - No Toxicity Information (NTX)
 - Essential Nutrient (NUT)
 - Below Screening Level (BSL)

Definitions:

N/A = Not Applicable

ND = Not Detected

SQL = Sample Quantitation Limit

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = Estimated Value

n = Presumptive evidence of material

C = Carcinogenic

N = Non-Carcinogenic

W = Water

NF = Nonfood

F = Food

TABLE 2.1 (continued)

| | |
|---------------------|-------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Unrestricted School Property* |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | Background Value | (2) (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-----------|---------------------------------|----------------------|---------------------------------|----------------------|-------|---|------------------------|---------------------------------|--|---------------------|---|--------------------------------|---------------------------------|--------------|--|
| 7429905 | Aluminum | 830 | | 2,700 | | mg/kg | BDSB085 | 7/7 | NA | 2,700 | NA | 7,600 | N | | NO | BSL |
| 7440360 | Antimony | 0.63 | J | 3.3 | J | mg/kg | DSS08/BDSS085 | 5/6 | 1 - 2 | 3.3 | NA | 3.1 | N | | YES | ASL |
| 7440382 | Arsenic | 3.6 | | 5.1 | J | mg/kg | BDSS08 | 3/6 | 0.44 - 2 | 5 | NA | 0.39 | C | | YES | ASL |
| 7440393 | Barium | 4.1 | | 120 | | mg/kg | BDSS085 | 7/7 | NA | 120 | NA | 110** | N | | YES | ASL |
| 7440417 | Beryllium | 0.25 | J | 0.25 | J | mg/kg | BDSB085 | 1/7 | 0.02 - 1 | 0.25 | NA | 15 | N | | NO | BSL |
| 7440439 | Cadmium | 0.14 | J | 1.9 | | mg/kg | BDSS08 | 6/7 | 0.07 - 0.07 | 2 | NA | 3.7 | N | | NO | BSL |
| | Calcium | 630 | | 10,000 | | mg/kg | BDSB085 | 7/7 | NA | 10,000 | NA | NA | | | NO | NUT |
| 18540299 | Chromium | 1.7 | J | 15 | J | mg/kg | BDSS08 | 7/7 | NA | 15 | NA | 23 | C | | NO | BSL |
| 7440484 | Cobalt | 0.50 | J | 2.1 | J | mg/kg | BDSS08 | 5/7 | 0.31 - 1 | 2 | NA | 476 | N | | NO | BSL |
| 7440508 | Copper | 2.4 | | 160 | | mg/kg | BDSS085 | 7/7 | NA | 160 | NA | 110** | N | | YES | ASL |
| 57125 | Cyanide | 0.41 | J | 0.71 | J | mg/kg | BDSB085 | 2/2 | NA | 1 | NA | 30** | N | | NO | BSL |
| 7439896 | Iron | 420 | J | 17,000 | J | mg/kg | BDSS08 | 7/7 | NA | 17,000 | NA | 2,300 | N | | YES | ASL |
| 7439921 | Lead | 5 | J | 780 | | mg/kg | BDSB084 | 7/7 | NA | 780 | NA | 400 | N | | YES | ASL |
| 7439954 | Magnesium | 120 | J | 1,100 | | mg/kg | BDSB085 | 6/7 | 50 - 50 | 1,100 | NA | NA | | | NO | NUT |

*This area includes samples BDSS06, BDSS07, BDSS08, BDSS09, BDSS10, BDSB84, and BDSB85.

****The Florida Soil Cleanup Target Level (SCTL) was used.**

- | | | | |
|-----|---|-----------|---|
| (1) | Minimum/maximum detected concentration. | | |
| (2) | Background concentrations are not being used for this evaluation. | | |
| (3) | Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1 | | |
| (4) | EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate. | | |
| (5) | Rationale Codes | Selection | Reason: |
| | | | Intrequent Detection but Associated Historically (HIST) |
| | | | Frequent Detection (FD) |
| | | | Toxicity Information Available (TX) |
| | | | Above Screening Levels (ASL) |
| | | | Carcinogenic PAHs evaluated as a group (CPAH) |

Deletion Reason:

- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)

Definitions:

- N/A = Not Applicable
- ND = Not Detected
- SQL = Sample Quantitation Limit
- COPC = Chemical of Potential Concern
- ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
- J = Estimated Value
- n = Presumptive evidence of material
- C = Carcinogenic
- N = Non-Carcinogenic
- W = Water
- NF = Nonfood
- F = Food

TABLE 1
OCCURRENCE, DISTRIBUTION AND SELECTED CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|--------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Restricted Area North of the School* |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-------------------------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 67641 | Acetone | 46 | | 46 | | ug/kg | BDSB079 | 1/3 | 12 - 13 | 46 | NA | 160,000 | N | | NO | BSL |
| 75150 | Carbon Disulfide | 2 | J | 2 | J | ug/kg | BDSB079 | 1/3 | 12 - 13 | 2 | NA | 36,000 | N | | NO | BSL |
| 67663 | Chloroform | 0.8 | J | 0.8 | J | ug/kg | BDSB079 | 1/3 | 12 - 13 | 0.8 | NA | 240 | N | | NO | BSL |
| 100414 | Ethylbenzene | 0.8 | J | 0.8 | J | ug/kg | BDSB079 | 1/3 | 12 - 13 | 0.8 | NA | 230,000 | N | | NO | BSL |
| 1330207 | M,P-Xylene | 2 | J | 2 | J | ug/kg | BDSB079 | 1/1 | NA | 2 | NA | 21,000(6) | N | | NO | BSL |
| 75092 | Methylene Chloride | 11 | J | 11 | J | ug/kg | BDSB079 | 1/3 | 13 - 20 | 11 | NA | 8,900 | C | | NO | BSL |
| 95476 | O-Xylene | 0.5 | J | 0.5 | J | ug/kg | BDSB079 | 1/1 | NA | 0.5 | NA | 21,000(6) | N | | NO | BSL |
| 108883 | Toluene | 4 | J | 4 | J | ug/kg | BDSB079 | 1/3 | 12 - 13 | 4 | NA | 52,000 | N | | NO | BSL |
| 1330207 | Total Xylenes | 3 | J | 3 | J | ug/kg | BDSB079 | 1/3 | NA | 3 | NA | 21,000 | N | | NO | BSL |
| 83329 | Acenaphthene | 49 | J | 49 | J | ug/kg | BDSS15 | 1/2 | 400 - 400 | 49 | NA | 370,000 | N | | NO | BSL |
| 95748 | Carbazole | 110 | J | 110 | J | ug/kg | BDSS15 | 1/2 | 400 - 400 | 110 | NA | 24,000 | C | | NO | BSL |
| 85018 | Phenanthrene | 310 | J | 900 | | ug/kg | BDSS15 | 2/2 | NA | 900 | NA | 2,000,000** | N | | NO | BSL |
| 120127 | Anthracene | 55 | J | 71 | J | ug/kg | BDSS15 | 2/2 | NA | 71 | NA | 2,200,000 | N | | NO | BSL |
| 206440 | Fluoranthene | 380 | | 2,000 | | ug/kg | BDSS15 | 2/2 | NA | 2,000 | NA | 230,000 | N | | NO | BSL |
| 129000 | Pyrene | 470 | J | 2,000 | J | ug/kg | BDSS15 | 2/2 | NA | 2,000 | NA | 230,000 | N | | NO | BSL |
| 56553 | Benzo(a)anthracene | 250 | J | | | ug/kg | BDSS15 | 2/2 | NA | 690 | NA | 620 | C | | YES | ASL, CPAH |
| 218019 | Chrysene | 190 | J | 730 | | ug/kg | BDSS15 | 2/2 | NA | 730 | NA | 62,000 | C | | YES | CPAH |
| 117817 | Bis(2-ethyl hexyl)phthalate | 500 | | 500 | | ug/kg | BDSS15 | 2/2 | NA | 500 | NA | 35,000 | C | | NO | BSL |
| 205992 | Benzo(b and/or k)fluoranthene | 290 | J | 1,300 | J | ug/kg | BDSS15 | 2/2 | NA | 1,300 | NA | 620 | | | YES | ASL, CPAH |

* This area includes samples BDSS12, BDSS15, BDSB79, BDSB80, BDSB82, and BDSB83.

**The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason:

Infrequent Detection but Associated Historically (HIST)
 Carcinogenic PAHs Evaluated as a Group (CPAH)
 Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:
 Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

(6) Screening value for total xylene used.

Definitions

N/A = Not Applicable
 ND = Not Detected
 NE = Not Established
 SQL = Sample Quantitation Limit
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nontoxic
 F = Food
 c = Confirmed via gas chromatography/mass spectroscopy

TABLE 2.2 (Continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|--------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Restricted Area North of the School* |

| CAS Number | Chemical | (1) Minimum Concentration | (1) Minimum Qualifier | (1) Maximum Concentration | (1) Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-------------------------|------------------------------|--------------------------|------------------------------|--------------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 50328 | Benzo(a)pyrene | 170 | J | 740 | | ug/kg | BDSS15 | 2/2 | NA | 740 | NA | 62 C | | | YES | YES, CPAH |
| 103395 | Indeno(1,2,3-cd)pyrene | 110 | J | 380 | J | ug/kg | BDSS15 | 2/2 | NA | 380 | NA | 620 C | | | YES | CPAH |
| 53703 | Dibenzo(a,h)anthracene | 150 | J | 150 | J | ug/kg | BDSS15 | 1/2 | 400 - 400 | 150 | NA | 62 C | | | YES | ASL, CPAH |
| | Benzo(g,h,i)perylene | 120 | J | 440 | | ug/kg | BDSS15 | 2/2 | NA | 440 | NA | 2,300,000** C | | | NO | BSL |
| 60571 | Dieldrin | 2.2 | J | 59 | | ug/kg | BDSS15 | 2/3 | 19 - 19 | 59 | NA | 30 C | | | YES | ASL |
| 76448 | Heptachlor | 1.6 | J | 1.6 | J | ug/kg | BDSS12 | 1/3 | 2.3 - 9.4 | 1.6 | NA | 110 C | | | NO | BSL |
| 11096825 | PCB 1260 (Aroclor 1260) | 33 | J | 1,400 | c | ug/kg | BDSS15 | 1/3 | 37 - 37 | 1,400 | NA | 220 C | | | YES | ASL |
| 7429905 | Aluminum | 5,000 | | 6,300 | | mg/kg | BDSB079 | 3/3 | NA | 6,300 | NA | 7,600 N | | | NO | BSL |
| 7440360 | Antimony | 11 | J | 19 | J | mg/kg | BDSS12 | 2/3 | 0.56 - 0.56 | 19 | NA | 3.1 N | | | YES | ASL |
| 7440382 | Arsenic | 1.8 | J | 35 | | mg/kg | BDSS12 | 3/3 | NA | 35 | NA | 0.39 C | | | YES | ASL |
| 7440393 | Barium | 29 | J | 1,200 | | mg/kg | BDSS12 | 3/3 | NA | 1,200 | NA | 110** N | | | YES | ASL |
| 7440417 | Beryllium | 0.26 | J | 0.26 | J | mg/kg | BDSB079 | 1/3 | 1 - 1 | 0.26 | NA | 15 N | | | NO | BSL |
| 7440439 | Cadmium | 0.27 | J | 8.1 | | mg/kg | BDSS15 | 3/3 | NA | 8.1 | NA | 3.7 N | | | YES | ASL |
| | Calcium | 6,800 | | 8,400 | | mg/kg | BDSS15 | 3/3 | NA | 8,400 | NA | N/A | | | NO | NUT |
| 18540299 | Chromium | 9.5 | | 79 | J | mg/kg | BDSS12 | 3/3 | NA | 79 | NA | 23 N | | | YES | ASL |

* This area includes samples BDSS12, BDSS15, BDSB079, BDSB80, BDSB82, and BDSB83.

**The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
 - Carcinogenic PAHs Evaluated as a Group (CPAH)
 - Frequent Detection (FD)
 - Toxicity Information Available (TX)
 - Above Screening Levels (ASL)
 - Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:

- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)

(6) Screening value for total xylene used.

Definitions:

N/A = Not Applicable
 ND = Not Detected
 NE = Not Established
 SQL = Sample Quantitation Limit
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food
 c = Confirmed via gas chromatography/mass spectroscopy

TABLE 2.2 (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|--------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Restricted Area North of the School* |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|--------------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 7440484 | Cobalt | 0.97 | J | 14 | | mg/kg | BDSS12 | 3/3 | NA | 14 | N/A | 470 | N | | NO | BSL |
| 7440508 | Copper | 11 | J | 4,100 | | mg/kg | BDSS12 | 3/3 | NA | 4,100 | N/A | 110** | N | | YES | ASL |
| 57125 | Cyanide | 0.12 | J | 0.12 | J | mg/kg | BDSB079 | 1/1 | NA | 0.12 | N/A | 30** | N | | NO | BSL |
| 7439896 | Iron | 6,400 | | 110,000 | J | mg/kg | BDSS12 | 3/3 | NA | 110,000 | N/A | 2300 | N | | YES | ASL |
| 7439921 | Lead | 204 | | 9,100 | J | mg/kg | BDSS12 | 5/6 | 51 - 51 | 9,100 | N/A | 400 | N | | YES | ASL |
| 7439954 | Magnesium | 600 | J | 4,900 | | mg/kg | BDSS12 | 3/3 | NA | 4,900 | N/A | N/A | | | NO | NUT |
| 7439965 | Manganese | 24 | | 790 | J | mg/kg | BDSS12 | 3/3 | NA | 790 | N/A | 180 | N | | YES | ASL |
| 7439976 | Mercury (Total) | 0.0041 | | 0.95 | | mg/kg | BDSS15 | 3/3 | NA | 0.95 | N/A | 2.3 | N | | NO | BSL |
| 7440020 | Nickel | 2.5 | J | 100 | | mg/kg | BDSS12 | 3/3 | NA | 100 | N/A | 110** | N | | NO | BSL |
| 7440097 | Potassium | 210 | J | 530 | | mg/kg | BDSS12 | 3/3 | NA | 530 | N/A | N/A | | | NO | NUT |
| 7440224 | Silver | 4.4 | | 4.6 | | mg/kg | BDSS15 | 2/3 | 0.21 - 0.21 | 4.6 | N/A | 39 | N | | NO | BSL |
| 7440235 | Sodium | 120 | J | 330 | | mg/kg | BDSS12 | 2/3 | 63 - 63 | 330 | N/A | N/A | | | NO | NUT |
| 7440622 | Vanadium | 13 | | 21 | | mg/kg | BDSS15 | 3/3 | NA | 21 | N/A | 15** | N | | YES | ASL |
| 7440666 | Zinc | 60 | | 2,800 | | mg/kg | BDSS12 | 3/3 | NA | 2,800 | N/A | 2,300 | N | | YES | ASL |
| 1746016 | 2,3,7,8-TCDD (TEQ) | 0.00066 | | 0.088 | J | ug/kg | BDSS15 | 3/3 | NA | 0.088 | N/A | 0.0039 | C | | YES | ASL |

* This area includes samples BDSS12, BDSS15, BDSB79, BDSB80, BDSB82, and BDSB83.

**The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason:
- | | |
|---|--|
| Infrequent Detection but Associated Historically (HIST) | |
| Carcinogenic PAHs Evaluated as a Group (CPAH) | |
| Frequent Detection (FD) | |
| Toxicity Information Available (TX) | |
| Above Screening Levels (ASL) | |
| Carcinogenic PAHs evaluated as a group (CPAH) | |
- Deletion Reason:
- | | |
|-------------------------------|--|
| Infrequent Detection (IFD) | |
| Background Levels (BKG) | |
| No Toxicity Information (NTX) | |
| Essential Nutrient (NUT) | |
| Below Screening Level (BSL) | |

Definitions:

N/A = Not Applicable
 ND = Not Detected
 NE = Not Established
 SQL = Sample Quantitation Limit
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food
 c = Confirmed via gas chromatography/mass spectroscopy

(6) Screening value for total xylene used.

380066

TABLE 1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Restricted Area North of the School

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-------------------------|---------------------------|-------------------|---------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|----------------------|------------------------------|--------------------------|---------------------------|-----------|---|
| 75354 | 1,1-Dichloroethene | 0.7 | J | 0.7 | J | ug/kg | BDSB079 | 1/1 | NA | 0.7 | NA | 54 C | | | NO | BSL |
| 100414 | Ethylbenzene | 0.8 | J | 0.8 | J | ug/kg | BDSB079 | 1/1 | NA | 0.8 | NA | 150,000 N | | | NO | BSL |
| 1330207 | M,P-Xylene | 3 | J | 3 | J | ug/kg | BDSB079 | 1/1 | NA | 3 | NA | 21,000(6) N | | | NO | BSL |
| 95476 | O-Xylene | 0.6 | J | 0.6 | J | ug/kg | BDSB079 | 1/1 | NA | 0.6 | NA | 21,000(6) N | | | NO | BSL |
| 108883 | Toluene | 1 | J | 1 | J | ug/kg | BDSB079 | 1/1 | NA | 1 | NA | 52,000 N | | | NO | BSL |
| 1330207 | Xylenes, Total | 3 | J | 3 | J | ug/kg | BDSB079 | 1/1 | NA | 3 | NA | 21,000 N | | | NO | BSL |
| 83329 | Acenaphthylene | 140 | J | 140 | J | ug/kg | BDSB079 | 1/1 | NA | 140 | NA | 1,100,000** N | | | NO | BSL |
| 120127 | Anthracene | 320 | J | 320 | J | ug/kg | BDSB079 | 1/1 | NA | 320 | NA | 2,200,000 N | | | NO | BSL |
| 56553 | Benzo(a)anthracene | 1,000 | | 1,000 | | ug/kg | BDSB079 | 1/1 | NA | 1,000 | NA | 620 C | | | YES | ASL, CPAH |
| 50328 | Benzo(a)pyrene | 890 | | 890 | | ug/kg | BDSB079 | 1/1 | NA | 890 | NA | 62 C | | | YES | CPAH |
| 205992 | Benzo(b)fluoranthene | 810 | | 810 | | ug/kg | BDSB079 | 1/1 | NA | 810 | NA | 620 C | | | YES | ASL, CPAH |
| | Benzo(g,h,i)perylene | 550 | | 550 | | ug/kg | BDSB079 | 1/1 | NA | 550 | NA | 2,300,000** N | | | NO | BSL |
| | Benzo(k)fluoranthene | 650 | | 650 | | ug/kg | BDSB079 | 1/1 | NA | 650 | NA | 6,200 C | | | YES | CPAH |
| 218019 | Chrysene | 920 | | 920 | | ug/kg | BDSB079 | 1/1 | NA | 920 | NA | 62,000 C | | | YES | CPAH |
| 53703 | Dibenzo(a,h)anthracene | 240 | J | 240 | J | ug/kg | BDSB079 | 1/1 | NA | 240 | NA | 62 C | | | YES | ASL, CPAH |
| 206440 | Fluoranthene | 2,100 | | 2,100 | | ug/kg | BDSB079 | 1/1 | NA | 2,100 | NA | 230,000 N | | | NO | BSL |
| 193395 | Indeno(1,2,3-c,d)pyrene | 530 | | 530 | | ug/kg | BDSB079 | 1/1 | NA | 530 | NA | 620 C | | | YES | CPAH |

*This area includes subsurface soil samples BDSB12, BDSB15, BDSB79, BDSB80, BDSB82, and BDSB83.

**The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason:
 Infrequent Detection but Associated Historically (HIST)
 Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)
 Deletion Reason:
 Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

Definitions:
 N/A = Not Applicable
 ND = Not Detected
 SQL = Sample Quantitation Limit
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food

(6) Screening value for total xylene used.

380067

TABLE 2.3 (Continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|-------------------------------------|
| Scenario Timeframe: | Future |
| Medium: | Subsurface Soil |
| Exposure Medium: | Subsurface Soil |
| Exposure Point: | Restricted Area North of the School |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-----------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 85018 | Phenanthrene | 1,000 | | 1,000 | | ug/kg | BDSB079 | 1/1 | NA | 1,000 | NA | 2,000,000** | N | | NO | BSL |
| 129000 | Pyrene | 1,300 | | 1,300 | | ug/kg | BDSB079 | 1/1 | NA | 1,300 | NA | 230,000 | N | | NO | ASL |
| 7429905 | Aluminum | 10,000 | | 10,000 | | mg/kg | BDSB079 | 1/1 | NA | 10,000 | NA | 7,600 | N | | YES | ASL |
| 7440360 | Antimony | 41 | J | 41 | J | mg/kg | BDSB079 | 1/1 | 0.62 - 0.62 | 41 | NA | 3.1 | N | | YES | ASL |
| 7440382 | Arsenic | 88 | | 88 | | mg/kg | BDSB079 | 1/1 | NA | 88 | NA | 0.39 | C | | YES | ASL |
| 7440393 | Barium | 1200 | | 1200 | | mg/kg | BDSB079 | 1/1 | NA | 1,200 | NA | 110** | N | | YES | ASL |
| 7440417 | Beryllium | 0.32 | J | 0.32 | J | mg/kg | BDSB079 | 1/1 | NA | 0.32 | NA | 15 | N | | NO | BSL |
| 7440439 | Cadmium | 13 | | 13 | | mg/kg | BDSB079 | 1/1 | 0.11 - 0.11 | 13 | NA | 3.7 | N | | YES | ASL |
| | Calcium | 28,000 | | 28,000 | | mg/kg | BDSB079 | 1/1 | NA | 28,000 | NA | NA | | | NO | NUT |
| 18540299 | Chromium, Total | 130 | | 130 | | mg/kg | BDSB079 | 1/1 | NA | 130 | NA | 23 | C | | YES | ASL |
| 7440484 | Cobalt | 18 | J | 18 | | mg/kg | BDSB079 | 1/1 | NA | 18 | NA | 470 | N | | NO | BSL |
| 7440508 | Copper | 1,300 | | 1,300 | J | mg/kg | BDSB079 | 1/1 | 0.9 - 0.9 | 1,300 | NA | 110** | N | | YES | ASL |
| 57125 | Cyanide | 1.4 | | 1.4 | | mg/kg | BDSB079 | 1/1 | NA | 1 | NA | 30** | N | | NO | BSL |
| 7439896 | Iron | 220,000 | | 220,000 | | mg/kg | BDSB079 | 1/1 | NA | 220,000 | NA | 2,300 | N | | YES | ASL |
| 7439921 | Lead | 416 | | 3,800 | J | mg/kg | BDSB079 | 3/3 | NA | 3,800 | NA | 400 | N | | YES | ASL |
| 7439954 | Magnesium | 1,800 | | 1,800 | | mg/kg | BDSB079 | 1/1 | NA | 1,800 | NA | NA | | | NO | NUT |

*This area includes subsurface soil samples BDSB12, BDSB15, BDSB79, BDSB80, BDSB82, and BDSB83.

**The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration
- (2) Background concentrations are not being used for this evaluation.
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
- (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
- (5) Rationale Codes Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
 - Frequent Detection (FD)
 - Toxicity Information Available (TX)
 - Above Screening Levels (ASL)
 - Carcinogenic PAHs evaluated as a group (CPAH)
- Deletion Reason:
- Infrequent Detection (IFD)
 - Background Levels (BKG)
 - No Toxicity Information (NTX)
 - Essential Nutrient (NUT)
 - Below Screening Level (BSL)

Definitions:

N/A = Not Applicable

ND = Not Detected

SQL = Sample Quantitation Limit

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = Estimated Value

n = Presumptive evidence of material

C = Carcinogenic

N = Non-Carcinogenic

W = Water

NF = Nonfood

F = Food

(6) Screening value for total xylene used.

380068

TABLE 2.3 (Continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|-------------------------------------|
| Scenario Timeframe: | Future |
| Medium: | Subsurface Soil |
| Exposure Medium: | Subsurface Soil |
| Exposure Point: | Restricted Area North of the School |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|--------------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 7439965 | Manganese | 1400 | | 1400 | | mg/kg | BDSB079 | 2/2 | NA | 1400 | NA | 180 N | | | YES | ASL |
| 7439976 | Mercury | 0.56 | | 0.56 | | mg/kg | BDSB079 | 2/2 | NA | 0.56 | NA | 2.3 N | | | NO | BSL |
| 7440020 | Nickel | 90 | J | 90 | J | mg/kg | BDSB079 | 2/2 | NA | 90 | NA | 110** N | | | NO | BSL |
| | Potassium | 820 | J | 820 | J | mg/kg | BDSB079 | 2/2 | NA | 820 | NA | NA | | | NO | NUT |
| 7440224 | Silver | 6.8 | | 6.8 | | mg/kg | BDSB079 | 1/2 | 0.24 - 0.24 | 6.8 | NA | 39 N | | | NO | ASL |
| | Sodium | 1500 | J | 1500 | J | mg/kg | BDSB079 | 1/2 | 51 - 51 | 1500 | NA | NA | | | NO | NUT |
| 7440622 | Vanadium | 24 | | 24 | | mg/kg | BDSB079 | 2/2 | NA | 24 | NA | 15** N | | | YES | ASL |
| 1746016 | 2,3,7,8-TCDD (TEQ) | 0.095 | | 0.095 | | ug/kg | BDSB079 | 1/1 | NA | 0.095 | N/A | 0.0039 C | | | YES | ASL |

*This area includes subsurface soil samples BDSB12, BDSB15, BDSB79, BDSB80, BDSB82, and BDSB83.

**The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
(2) Background concentrations are not being used for this evaluation.
(3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
(4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
(5) Rationale Codes Selection Reason:
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

Definitions:
N/A = Not Applicable
ND = Not Detected
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
n = Presumptive evidence of material
C = Carcinogenic
N = Non-Carcinogenic
W = Water
NF = Nonfood
F = Food

(6) Screening value for total xylene used.

380069

TABLE
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|----------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Water |
| Exposure Medium: | Surface Water |
| Exposure Point: | Moncrief Creek |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|---------------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 78933 | Methyl Ethyl Ketone | 10 | J | 37 | J | ug/L | BDSW03 | 2/2 | 10 - 10 | 37 | | 120,000* | | | NO | BSL |
| 7429905 | Aluminum | 42 | J | 70 | | ug/L | BDSW03 | 3/3 | NA | 70 | | 13* | N | | YES | ASL |
| 7440382 | Arsenic | 11 | | 11 | | ug/L | BDSW03 | 1/3 | 3.2 - 8 | 11 | | 0.018 | C | | YES | ASL |
| 7440393 | Barium | 42 | | 50 | | ug/L | BDSW006 | 3/3 | NA | 50 | | NE | N | | YES | TX |
| | Calcium | 50,000 | | 67,000 | | ug/L | BDSW004 | 3/3 | NA | 67,000 | | NE | | | NO | NUT |
| 18540299 | Chromium | 3 | J | 4 | J | ug/L | BDSW03 | 2/3 | NA | 4 | | NE | N | | YES | TX |
| 7439896 | Iron | 290 | | 640 | J | ug/L | BDSW03 | 3/3 | NA | 640 | | 300 | N | | YES | ASL |
| 7439954 | Magnesium | 9,000 | | 20,000 | | ug/L | BDSW004 | 3/3 | NA | 20,000 | | NE | | | NO | NUT |
| 7439965 | Manganese | 21 | | 27 | | ug/L | BDSW04 | 3/3 | NA | 27 | | NE | N | | YES | TX |
| | Potassium | 2,500 | J | 3,400 | J | ug/L | BDSW04 | 3/3 | NA | 3,400 | | NE | | | NO | NUT |
| | Sodium | 12,000 | | 14,000 | | ug/L | BDSW04 | 3/3 | NA | 14,000 | | NE | | | NO | NUT |

*The Florida Surface Water Target Levels were used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) U.S. EPA National Recommended Water Quality Criteria-Correction April 1999, human health for consumption of water and organism values
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason.

Infrequent Detection but Associated Historically (HIST)
 Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:

Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

Definitions:

N/A = Not Applicable
 ND = Not Detected
 NE = Not Established
 SQL = Sample Quantitation Limit
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic

TABLE
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|-------------------|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Groundwater |
| Exposure Point: | Surficial Aquifer |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|--------------------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 84742 | Di-n-butylphthalate | 0.35 | J | 0.35 | J | ug/L | BDMW003 | 1/17 | 10 - 10 | 0.35 | NA | 360 N | | | NO | BSL |
| 206440 | Fluoranthene | 0.44 | J | 0.44 | J | ug/L | BDMW003 | 1/17 | 10 - 10 | 0.44 | NA | 15 N | | | NO | BSL |
| 85018 | Phenanthrene | 0.5 | J | 0.5 | J | ug/L | BDMW003 | 1/17 | 10 - 10 | 0.5 | NA | 210 N | | | NO | BSL |
| 120000 | Pyrene | 0.76 | J | 0.76 | J | ug/L | BDMW003 | 1/17 | 10 - 10 | 0.76 | NA | 11 N | | | NO | BSL |
| 309002 | Aldrin | 0.026 | J | 0.026 | J | ug/L | BDMW001 | 1/17 | 0.05 - 0.05 | 0.026 | NA | 0.004 C | | | YES | ASL |
| 72208 | Endrin | 0.02 | J | 0.02 | J | ug/L | BDMW010 | 1/17 | 0.1 - 0.1 | 0.02 | NA | 1.1 N | | | NO | BSL |
| | Endrin Ketone | 0.039 | J | 0.039 | J | ug/L | BDMW001 | 1/17 | 0.1 - 0.1 | 0.039 | NA | 1.1 N | | | NO | BSL |
| | gamma-Chlordane | 0.5 | J | 0.5 | J | ug/L | BDMW010 | 1/17 | 0.05 - 0.05 | 0.5 | NA | 0.19 N | | | YES | ASL |
| 76448 | Heptachlor | 0.039 | J | 0.13 | J | ug/L | BDMW010 | 2/17 | 0.05 - 0.05 | 0.13 | NA | 0.015 C | | | YES | ASL |
| 1024573 | Heptachlor Epoxide | 0.0385 | J | 0.0385 | J | ug/L | BDMW001 | 1/17 | 0.05 - 0.05 | 0.0385 | NA | 0.0074 C | | | YES | ASL |
| 72559 | p,p'-DDE | 0.0255 | J | 0.2 | J | ug/L | BDMW010 | 1/17 | 0.1 - 0.1 | 0.2 | NA | 0.2 C | | | YES | ASL |
| 50293 | p,p'-DDT | 0.034 | J | 0.034 | J | ug/L | BDMW001 | 1/17 | 0.1 - 0.1 | 0.034 | NA | 0.2 C | | | NO | BSL |
| 12674112 | PCB-1016 (Arochlor 1016) | 1.15 | J | 3 | J | ug/L | BDMW001 | 2/17 | 1 - 1.0 | 3 | NA | 0.096 N | | | YES | ASL |
| 7440382 | Arsenic | 3.6 | J | 3.6 | J | ug/L | BDMW009 | 1/14 | 3.2 - 3.2 | 3.6 | ND | 0.045 C | | | YES | ASL |

(1) Minimum/maximum detected concentration.

(2) Value shown is the average background concentration.

(3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 tap water values equal to a carcinogenic risk of 10⁻⁶ or a hazard quotient of 0.1.

(4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.

(5) Rationale Codes Selection Reason:

- Infrequent Detection but Associated Historically (HIST)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)
- Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:

- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)

Definitions:

NA = Not Applicable

ND = Not Detected

NE = Not Established

SQL = Sample Quantitation Limit

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = Estimated Value

n = Presumptive evidence of material

C = Carcinogenic

N = Non-Carcinogenic

NF = Nonfood

TABLE 2 (Continued)
OCCURRENCE, DISTRIBUTION AND SELECTED DATA OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|-------------------|
| Scenario Timeframe: | Future |
| Medium: | Water |
| Exposure Medium: | Groundwater |
| Exposure Point: | Surficial Aquifer |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/ TBC Value | Potential ARAR/ TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|--------------------|---------------------------------|----------------------|---------------------------------|----------------------|-------|---|------------------------|---------------------------------|--|----------------------------|------------------------------------|------------------------------------|-------------------------------------|--------------|--|
| 7440393 | Barium | 25 | | 240 | | ug/L | BDMW011 | 10/14 | NA | 240 | 112.5 | 260 | N | | NO | BSL |
| 7440717 | Beryllium | 0.99 | J | 0.99 | J | ug/L | BDMW009 | 1/14 | 0.54 - 0.54 | 0.99 | ND | 7.3 | N | | NO | ASL |
| | Calcium | 2,500 | | 140,000 | | ug/L | BDMW003 | 14/14 | NA | 140,000 | 8,700 | NA | | | NO | NUT |
| 7440484 | Cobalt | 1.6 | J | 8 | J | ug/L | BDMW009 | 1/14 | 1.4 - 2 | 8 | 1.5 | 220 | N | | NO | BSL |
| 7439896 | Iron | 120 | | 25,000 | | ug/L | BDMW004 | 7/14 | 12 - 18 | 25,000 | 670 | 150 | N | | YES | ASL |
| 7439921 | Lead | 2 | | 3.2 | | ug/L | BDMW005 | 4/14 | 1.5 - 880 | 3.2 | ND | 15 | N | | NO | ASL |
| | Magnesium | 1,150 | J | 41,000 | | ug/L | BDMW013 | 14/14 | NA | 41,000 | 4,650 | NA | | | NO | NUT |
| 7439965 | Manganese | 3.55 | J | 390 | | ug/L | BDMW003 | 14/14 | NA | 390 | 47.5 | 88 | N | | YES | ASL |
| 7439976 | Mercury | 0.072 | J | 0.072 | J | ug/L | BDMW005 | 1/14 | 0.072 - 30 | 0.072 | ND | 1.1 | N | | NO | BSL |
| 7440020 | Nickel | 8.9 | J | 8.9 | J | ug/L | BDMW009 | 1/14 | 4 - 4.7 | 8.9 | ND | 73 | N | | NO | BSL |
| | Potassium | 2,000 | J | 61,000 | | ug/L | BDMW006 | 14/14 | NA | 61,000 | 1,935 | NA | | | NO | NUT |
| 7782492 | Selenium | 6 | | 6 | | ug/L | BDMW008 | 1/14 | NA | 6 | ND | 18 | N | | NO | BSL |
| | Sodium | 1,800 | J | 39,000 | | ug/L | BDMW013 | 14/14 | NA | 39,000 | 20,500 | NA | | | NO | NUT |
| 7440622 | Vanadium | 9.1 | J | 9.1 | J | ug/L | BDMW008 | 1/14 | 2 - 2.2 | 9.1 | ND | 26 | N | | NO | BSL |
| 7440666 | Zinc | 6.1 | J | 150 | | ug/L | BDMW003 | 5/14 | 5.9 - 5.9 | 150 | 4.43 | 1,100 | N | | NO | BSL |
| 1746016 | 2,3,7,8-TCDD (TEQ) | 0.00000006 | J | 0.00000006 | J | ug/L | BDMW014 | 1/1 | NA | 0.00000006 | NA | 0.00000045 | N | | NO | BSL |

- (1) Minimum/maximum detected concentration.
(2) Value shown is the average background concentration.
(3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 tap water values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1.
(4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
(5) Rationale Codes Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
 - Frequent Detection (FD)
 - Toxicity Information Available (TX)
 - Above Screening Levels (ASL)
 - Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:

- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)

Definitions:

N/A = Not Applicable
ND = Not Detected
NE = Not Established
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
n = Presumptive evidence of material
C = Carcinogenic
N = Non-Carcinogenic
NF = Nonfood

TAB
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
BROWN'S DUMP SITE

| | |
|---------------------|------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Unrestricted School Property |

| Chemical of Potential Concern | Units | Arithmetic Mean(2) | 95% UCL of Log Normal Data(3) | Maximum Detected Concentration | Maximum Qualifier | EPC Units | Reasonable Maximum Exposure | | | Central Tendency(4) | | |
|---------------------------------|-------|--------------------|-------------------------------|--------------------------------|-------------------|-----------|-----------------------------|----------------------|----------------------|---------------------|----------------------|----------------------|
| | | | | | | | Medium EPC Value | Medium EPC Statistic | Medium EPC Rationale | Medium EPC Value | Medium EPC Statistic | Medium EPC Rationale |
| Benzo(a)anthracene | ug/kg | 1,180 | NC | 2,100 | J | mg/kg | 0.21 | Max | Max | | | |
| Benzo(a)pyrene | ug/kg | 731 | NC | 1,900 | J | mg/kg | 1.9 | Max | Max | | | |
| Benzo(b and/or k) fluoranthene* | ug/kg | 1,347 | NC | 3,500 | J | mg/kg | 0.35 | Max | Max | | | |
| Chrysene | ug/kg | 872 | NC | 2,300 | J | mg/kg | 0.0023 | Max | Max | | | |
| Indeno(1,2,3-cd)pyrene | ug/kg | 605 | NC | 1,100 | J | mg/kg | 0.11 | Max | Max | | | |
| TEF(1) | ug/kg | N/A | N/A | N/A | | mg/kg | 2.57 | N/A | N/A | | | |
| PCB-1260 (Aroclor 1260) | ug/kg | 209 | NC | 350 | | mg/kg | 0.35 | Max | Max | | | |
| 2,3,7,8-TCDD (TEQ) | ug/kg | 7 | NC | 0.017 | J | mg/kg | 0.000017 | Max | Max | | | |
| Antimony | mg/kg | 3 | NC | 3.3 | J | mg/kg | 3.3 | Max | Max | | | |
| Arsenic | mg/kg | 5 | NC | 5.1 | J | mg/kg | 5.1 | Max | Max | | | |
| Barium | mg/kg | 53 | NC | 120 | | mg/kg | 120 | Max | Max | | | |
| Copper | mg/kg | 57 | NC | 160 | | mg/kg | 160 | Max | Max | | | |
| Iron | mg/kg | 7,417 | NC | 17,000 | J | mg/kg | 17,000 | Max | Max | | | |
| Lead | mg/kg | 179 | NC | 780 | | mg/kg | 179 | Average | Average | | | |

Statistics: Maximum Detected Value (Max); 95% UCL of Log-transformed Data (95% UCL-T)

NC - Not Calculated. The 95% UCL was not calculated because the data set contained less than 10 samples; therefore, the maximum detected concentration will be used as the EPC.

(1) As an interim procedure, Region IV has adopted a toxicity equivalency factor (TEF) methodology for carcinogenic PAHs based on each compound's relative potency to the potency of benzo(a)pyrene (BAP). The following TEFs were used to convert the concentration of each PAH compound to an equivalent concentration of BAP: Benzo(a)anthracene (0.1), Benzo(a)pyrene (1), Benzo(b)fluoranthene (0.1), Benzo(k)fluoranthene (0.01), Chrysene (0.001), Dibenz(a,h)anthracene (1), and Indeno(1,2,3-cd)pyrene (0.1).

(2) Per EPA Region IV guidance (EPA, 1996a), this column contains the arithmetic average of detected concentrations only.

(3) Per EPA Region IV guidance (EPA, 1996a), it was assumed that the sampling data are log normally distributed.

(4) Per EPA Region IV guidance (EPA, 1996a), the central tendency evaluation will be presented in the risk characterization uncertainty section. Further, a central tendency evaluation will only be performed for scenarios, media, and chemicals of concern.

*The laboratory reported the compound as benzo(b and/or k)fluoranthene; therefore, the highest TEF was used (i.e., benzo(b)fluoranthene).

3
8
073

TABLE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
BROWN'S DUMP SITE

| | |
|---------------------|-------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Restricted Area North of the School |

| Chemical of Potential Concern | Units | Arithmetic Mean(1) | 95% UCL of Log Normal Data(2) | Maximum Detected Concentration | Maximum Qualifier | EPC Units | Reasonable Maximum Exposure | | | Central Tendency(3) | | |
|-------------------------------|-------|--------------------|-------------------------------|--------------------------------|-------------------|-----------|-----------------------------|----------------------|----------------------|---------------------|----------------------|----------------------|
| | | | | | | | Medium EPC Value | Medium EPC Statistic | Medium EPC Rationale | Medium EPC Value | Medium EPC Statistic | Medium EPC Rationale |
| Benzo(a)anthracene | ug/kg | 470 | NC | 690 | | mg/kg | 0.069 | Max | Max | | | |
| Benzo(a)pyrene | ug/kg | 455 | NC | 740 | | mg/kg | 0.74 | Max | Max | | | |
| Benzo(b and/or k)fluoranthene | ug/kg | 795 | NC | 1,300 | J | mg/kg | 0.13 | Max | Max | | | |
| Chrysene | ug/kg | 460 | NC | 730 | | mg/kg | 0.00073 | Max | Max | | | |
| Dibenz(a,h)anthracene | ug/kg | 150 | NC | 150 | J | mg/kg | 0.15 | Max | Max | | | |
| Indeno(1,2,3-cd)pyrene | ug/kg | 245 | NC | 380 | J | mg/kg | 0.036 | Max | Max | | | |
| TEF(1) | ug/kg | N/A | N/A | N/A | | mg/kg | 1.13 | N/A | N/A | | | |
| Dieldrin | ug/kg | 31 | NC | 59 | | mg/kg | 0.059 | Max | Max | | | |
| PCB 1260 (Aroclor 1260) | ug/kg | 717 | NC | 1,400 | c | mg/kg | 1.4 | Max | Max | | | |
| 2,3,7,8-TCDD (TEQ) | ug/kg | 35 | NC | 0.088 | | mg/kg | 0.000088 | Max | Max | | | |
| Antimony | mg/kg | 15 | NC | 19 | J | mg/kg | 19 | Max | Max | | | |
| Arsenic | mg/kg | 17 | NC | 35 | | mg/kg | 35 | Max | Max | | | |
| Barium | mg/kg | 593 | NC | 1,200 | | mg/kg | 1,200 | Max | Max | | | |
| Cadmium | mg/kg | 5 | NC | 8.1 | | mg/kg | 8 | Max | Max | | | |
| Chromium | mg/kg | 49 | NC | 79 | J | mg/kg | 79 | Max | Max | | | |
| Copper | mg/kg | 1,510 | NC | 4,100 | | mg/kg | 4,100 | Max | Max | | | |
| Iron | mg/kg | 65,133 | NC | 110,000 | J | mg/kg | 110,000 | Max | Max | | | |
| Lead | mg/kg | 2,263 | NC | 9,100 | JN | mg/kg | 2,263 | Average | Average | | | |
| Manganese | mg/kg | 1,271 | NC | 790 | J | mg/kg | 790 | Max | Max | | | |
| Vanadium | mg/kg | 17 | NC | 21 | | mg/kg | 21 | Max | Max | | | |
| Zinc | mg/kg | 1,687 | NC | 2,800 | | mg/kg | 2,800 | Max | Max | | | |

Statistics: Maximum Detected Value (Max); 95% UCL of Log-transformed Data (95% UCL-T)

NC - Not Calculated. The 95% UCL was not calculated because the data set contained less than 10 samples; therefore, the maximum detected concentration will be used as the EPC.

(1) As an interim procedure, Region IV has adopted a toxicity equivalency factor (TEF) methodology for carcinogenic PAHs based on each compound's relative potency to the potency of benzo(a)pyrene (BAP). The following TEFs were used to convert the concentration of each PAH compound to an equivalent concentration of BAP: Benzo(a)anthracene (0.1), Benzo(a)pyrene (1), Benzo(b)fluoranthene (0.1), Benzo(k)fluoranthene (0.01), Chrysene (0.001), Dibenz(a,h)anthracene (1), and Indeno(1,2,3-cd)pyrene (0.1).

(2) Per EPA Region IV guidance (EPA, 1996a), this column contains the arithmetic average of detected concentrations only.

(3) Per EPA Region IV guidance (EPA, 1996a), it was assumed that the sampling data are log normally distributed.

(4) Per EPA Region IV guidance (EPA, 1996a), the central tendency evaluation will be presented in the risk characterization uncertainty section. Further, a central tendency evaluation will only be performed for scenarios, media, and chemicals of concern.

*The laboratory reported the compound as benzo(b and/or k)fluoranthene; therefore, the highest TEF was used (i.e., benzo(b)fluoranthene).

38.0074

TABLE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
BROWN'S DUMP SITE

| | |
|---------------------|---------------------------------|
| Scenario Timeframe: | Future |
| Medium: | Subsurface Soil |
| Exposure Medium: | Subsurface Soil |
| Exposure Point: | Restricted Area North of School |

| Chemical of Potential Concern | Units | Arithmetic Mean(2) | 95% UCL of Log Normal Data(3) | Maximum Detected Concentration | Maximum Qualifier | EPC Units | Reasonable Maximum Exposure | | | Central Tendency(4) | | |
|-------------------------------|-------|--------------------|-------------------------------|--------------------------------|-------------------|-----------|-----------------------------|----------------------|----------------------|---------------------|----------------------|----------------------|
| | | | | | | | Medium EPC Value | Medium EPC Statistic | Medium EPC Rationale | Medium EPC Value | Medium EPC Statistic | Medium EPC Rationale |
| Benzo(a)anthracene | ug/kg | 1,000 | NC | 1,000 | | mg/kg | 0.1 | Max | Max | | | |
| Benzo(a)pyrene | ug/kg | 890 | NC | 890 | | mg/kg | 0.89 | Max | Max | | | |
| Benzo(b)fluoranthene | ug/kg | 810 | NC | 810 | | mg/kg | 0.081 | Max | Max | | | |
| Benzo(k)fluoranthene | ug/kg | 650 | NC | 650 | | mg/kg | 0.0065 | Max | Max | | | |
| Chrysene | ug/kg | 920 | NC | 920 | | mg/kg | 0.00092 | Max | Max | | | |
| Dibenz(a,h)anthracene | ug/kg | 240 | NC | 240 | | mg/kg | 0.24 | Max | Max | | | |
| Indeno(1,2,3-cd)pyrene | ug/kg | 530 | NC | 530 | | mg/kg | 0.053 | Max | Max | | | |
| TEF(1) | ug/kg | N/A | N/A | N/A | | mg/kg | 1.37 | N/A | N/A | | | |
| 2,3,7,8-TCDD (TEQ) | ug/kg | 0.095 | NC | 0.095 | | mg/kg | 0.000095 | Max | Max | | | |
| Aluminum | mg/kg | 10,000 | NC | 10,000 | | mg/kg | 10,000 | Max | Max | | | |
| Antimony | mg/kg | 41 | NC | 41 | | mg/kg | 41 | Max | Max | | | |
| Arsenic | mg/kg | 88 | NC | 88 | | mg/kg | 88 | Max | Max | | | |
| Barium | mg/kg | 1,200 | NC | 1,200 | | mg/kg | 1,200 | Max | Max | | | |
| Cadmium | mg/kg | 13 | NC | 13 | | mg/kg | 13 | Max | Max | | | |
| Chromium (Total) | mg/kg | 130 | NC | 130 | | mg/kg | 130 | Max | Max | | | |
| Copper | mg/kg | 1,300 | NC | 1,300 | | mg/kg | 1,300 | Max | Max | | | |
| Iron | mg/kg | 220,000 | NC | 220,000 | | mg/kg | 220,000 | Max | Max | | | |
| Lead | mg/kg | 2,369 | NC | 3,800 | | mg/kg | 2,369 | Average | Average | | | |
| Manganese | mg/kg | 1600 | NC | 1,400 | | mg/kg | 1,400 | Max | Max | | | |
| Vanadium | mg/kg | 24.0 | NC | 24 | | mg/kg | 24 | Max | Max | | | |

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.

Statistics: Maximum Detected Value (Max); 95% UCL of Log-transformed Data (95% UCL-T)

NC - Not Calculated. The 95% UCL was not calculated because the data set contained less than 10 samples; therefore, the maximum detected concentration will be used as the EPC.

N/A - Not Applicable

(1) As an interim procedure, Region IV has adopted a toxicity equivalency factor (TEF) methodology for carcinogenic PAHs based on each compound's relative potency to the potency of benzo(a)pyrene (BAP). The follo TEFs were used to convert the concentration of each PAH compound to an equivalent concentration of BAP: Benzo(a)anthracene (0.1), Benzo(a)pyrene (1), Benzo(b)fluoranthene (0.1), Benzo(k)fluoranthene (0.01), Chrysene (0.001), Dibenz(a,h)anthracene (1), and Indeno(1,2,3-cd)pyrene (0.1).

(2) Per EPA Region IV guidance (EPA, 1996a), this column contains the arithmetic average of detected concentrations only.

(3) Per EPA Region IV guidance (EPA, 1996a), it was assumed that the sampling data are log normally distributed.

(4) Per EPA Region IV guidance (EPA, 1996a), the central tendency evaluation will be presented in the risk characterization uncertainty section. Further, a central tendency evaluation will only be performed for scenarios media, and chemicals of concern.

TABLE 1
MEDIUM-SPECIFIC EXPOSURE P-VALUE CONCENTRATION SUMMARY
BROWN'S DUMP SITE

| | |
|---------------------|----------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Water |
| Exposure Medium: | Surface Water |
| Exposure Point: | Moncrief Creek |

| Chemical of Potential Concern | Units | Arithmetic Mean(1) | 95% UCL of Log Normal Data(2) | Maximum Detected Concentration | Maximum Qualifier | EPC Units | Reasonable Maximum Exposure | | | Central Tendency(3) | | |
|-------------------------------|-------|--------------------|-------------------------------|--------------------------------|-------------------|-----------|-----------------------------|----------------------|----------------------|---------------------|----------------------|----------------------|
| | | | | | | | Medium EPC Value | Medium EPC Statistic | Medium EPC Rationale | Medium EPC Value | Medium EPC Statistic | Medium EPC Rationale |
| Aluminum | ug/L | 56 | NC | 70 | | mg/L | 0.07 | Max | Max | | | |
| Arsenic | ug/L | 11 | NC | 11 | | mg/L | 0.011 | Max | Max | | | |
| Barium | ug/L | 46 | NC | 50 | | mg/L | 0.05 | Max | Max | | | |
| Chromium | ug/L | 4 | NC | 4 | | mg/L | 0.004 | Max | Max | | | |
| Iron | ug/L | 483 | NC | 640 | | mg/L | 0.640 | Max | Max | | | |
| Manganese | ug/L | 6,379 | NC | 27 | | mg/L | 0.027 | Max | Max | | | |

Statistics: Maximum Detected Value (Max); 95% UCL of Log-transformed Data (95% UCL-T)

NC - Not Calculated. The 95% UCL was not calculated because the data set contained less than 10 samples; therefore, the maximum detected concentration will be used as the EPC.

(1) Per EPA Region IV guidance (EPA, 1996a), this column contains the arithmetic average of detected concentrations only.

(2) Per EPA Region IV guidance (EPA, 1996a), it was assumed that the sampling data are log normally distributed.

(3) Per EPA Region IV guidance (EPA, 1996a), the central tendency evaluation will be presented in the risk characterization uncertainty section. Further, a central tendency evaluation will only be performed for scenarios, media, and chemicals of concern.

380076

TABLE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
BROWN'S DUMP SITE

| | |
|---------------------|-------------------|
| Scenario Timeframe: | Future |
| Medium: | Water |
| Exposure Medium: | Groundwater |
| Exposure Point: | Surficial Aquifer |

| Chemical of Potential Concern | Units | Arithmetic Average(1) | 95% UCL of Normal Data(2) | Maximum Detected Concentration | Maximum Qualifier | EPC Units | Reasonable Maximum Exposure | | | Central Tendency(4) | | |
|-------------------------------|-------|-----------------------|---------------------------|--------------------------------|-------------------|-----------|-----------------------------|----------------------|----------------------|---------------------|----------------------|----------------------|
| | | | | | | | Medium EPC Value(3) | Medium EPC Statistic | Medium EPC Rationale | Medium EPC Value | Medium EPC Statistic | Medium EPC Rationale |
| Aldrin | µg/L | 0.026 | N/A | 0.026 | | mg/L | 0.000026 | N/A | Arith. Mean | | | |
| gamma-Chlordane | µg/L | 0.12 | N/A | 0.5 | | mg/L | 0.00012 | N/A | Arith. Mean | | | |
| Heptachlor | µg/L | 0.049 | N/A | 0.13 | | mg/L | 0.000049 | N/A | Arith. Mean | | | |
| Heptachlor Epoxide | µg/L | 0.028 | N/A | 0.0385 | | mg/L | 0.000028 | N/A | Arith. Mean | | | |
| p,p'-DDE | µg/L | 0.075 | N/A | 0.2 | | mg/L | 0.000075 | N/A | Arith. Mean | | | |
| PCB-1016 (Aroclor 1016) | µg/L | 1.3 | N/A | 2.75 | | mg/L | 0.0013 | N/A | Arith. Mean | | | |
| Arsenic | µg/L | 2 | N/A | 3.6 | | mg/L | 0.002 | N/A | Arith. Mean | | | |
| Iron | µg/L | 2,172 | N/A | 25,000 | | mg/L | 2.17 | N/A | Arith. Mean | | | |
| Manganese | µg/L | 79.5 | N/A | 390 | | mg/L | 0.0795 | N/A | Arith. Mean | | | |

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration, for duplicate sample results, the average value was used in the calculation.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

1 This column contains the arithmetic average of detected and non-detected concentrations.

2 Per EPA Region IV guidance (EPA, 1996a), the groundwater exposure point concentration should be the arithmetic average of the wells in the highly concentrated area of the plume. Therefore, the 95% UCL is not calculated for this medium.

3 Per EPA Region IV guidance (EPA, 1996a), the groundwater exposure point concentration is the arithmetic average of the wells in the highly concentrated area of the plume. The wells used in the calculation of the groundwater exposure point concentration included: BDMW001, BDMW005, BDMW009, BDMW010, and BDMW012.

4 Per EPA Region IV guidance (EPA, 1996a), the central tendency evaluation will be presented in the risk characterization uncertainty section. Further, a central tendency evaluation will only be performed for scenarios and chemicals of concern.

38.0077

TABLE 4.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil/Subsurface Soil
Exposure Point: Exposure Unit 1; Exposure Unit 2
Receptor Population: Resident
Receptor Age: Child

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/Reference | CT Value | CT Rationale/Reference | Intake Equation/Model Name |
|----------------|----------------|-----------------------------------|--------------------|----------------------------------|-------------------------|----------|------------------------|---|
| Ingestion | CS | Chemical Concentration in Soil | mg/kg | See Table 3 | See Table 3 | | | Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF1 \times 1/BW \times 1/AT$ |
| | IR-S | Ingestion Rate of Soil | mg/kg | 200 | EPA, 1991 | | | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | | | |
| | ED | Exposure Duration | years | 6 | EPA, 1991 | | | |
| | CF1 | Conversion Factor 1 | kg/mg | 10-6 | — | | | |
| | BW | Body Weight | kg | 15 | EPA, 1991 | | | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | | | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,190 | EPA, 1989 | | | |
| Dermal | CS | Chemical Concentration in Soil | mg/kg | See Table 3 | See Table 3 | | | CDI (mg/kg-day) = $CS \times SA \times CF1 \times ABS \times AF \times EF \times ED \times 1/BW \times 1/AT$ |
| | SA | Skin Surface Area | cm ² | 4,000 | EPA, 1997a (1) | | | |
| | CF1 | Conversion Factor 1 | kg/mg | 10-6 | — | | | |
| | AF | Soil - to - Skin Adherence Factor | mg/cm ² | 1.0 | EPA, 1996a | | | |
| | ABS | Absorption Factor | — | 0.1% Inorganics 1.0% Organics | EPA, 1996a | | | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | | | |
| | ED | Exposure Duration | years | 6 | EPA, 1991 | | | |
| | BW | Body Weight | kg | 15 | EPA, 1991 | | | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | | | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,190 | EPA, 1989 | | | |

(1) Professional Judgment

Sources:

EPA, 1997a: Exposure Factors Handbook

EPA, 1991: Standard Default Exposure Factors

EPA, 1989: RAGS Part A

EPA 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

380078

TABLE 4.2
VALUES USED FOR DAILY INTAKE CALCULATIONS
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil/Subsurface Soil
Exposure Point: Exposure Unit 1; Exposure Unit 2
Receptor Population: Resident
Receptor Age: Adult

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|----------------|----------------|-----------------------------------|--------------------|----------------------------------|--------------------------|----------|-------------------------|---|
| Ingestion | CS | Chemical Concentration in Soil | mg/kg | See Table 3 | See Table 3 | | | Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF1 \times 1/BW \times 1/AT$ |
| | IR-S | Ingestion Rate of Soil | mg/kg | 100 | EPA, 1991 | | | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | | | |
| | ED | Exposure Duration | years | 24 | EPA, 1991 | | | |
| | CF1 | Conversion Factor 1 | kg/mg | 10-6 | — | | | |
| | BW | Body Weight | kg | 59 | | | | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | | | |
| Dermal | AT-N | Averaging Time (Non-Cancer) | days | — | — | | | CDI (mg/kg-day) = $CS \times SA \times CF1 \times ABS \times AF \times EF \times ED \times 1/BW \times 1/AT$ |
| | CS | Chemical Concentration in Soil | mg/kg | See Table 3 | See Table 3 | | | |
| | SA | Skin Surface Area | cm ² | 5,000 | EPA, 1997a (1) | | | |
| | CF1 | Conversion Factor 1 | kg/mg | 10-6 | | | | |
| | AF | Soil - to - Skin Adherence Factor | mg/cm ² | 1.0 | EPA, 1996a | | | |
| | ABS | Absorption Factor | — | 0.1% Inorganics 1.0% Organics | EPA, 1996a | | | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | | | |
| | ED | Exposure Duration | years | 24 | EPA, 1991 | | | |
| | BW | Body Weight | kg | 59 | (2) | | | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | | | |
| | AT-N | Averaging Time (Non-Cancer) | days | — | — | | | |

(1) Professional Judgment

(2) Based on site-specific information and a letter, dated October 11, 2000, from Glenn Adams, US EPA Region 4, to David A. Ludder, Legal Environmental Assistance Foundation.

Sources:

EPA, 1997a: Exposure Factors Handbook

EPA, 1991: Standard Default Exposure Factors

EPA, 1989: RAGS Part A

EPA 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

380079

TABLE 4.3
VALUES USED FOR DAILY INTAKE CALCULATIONS
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Moncrief Creek
Receptor Population: Resident
Receptor Age: Child

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|----------------|----------------|---|-------------------|-------------|--------------------------|----------|-------------------------|---|
| Ingestion | CW | Chemical Concentration in Surface Water | mg/L | See Table 3 | See Table 3 | | | Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF1 \times 1/BW \times 1/AT$ |
| | IR-W | Ingestion Rate | L/hour | 0.01 | (1) | | | |
| | EF | Exposure Frequency | days/year | 45 | EPA, 1996a | | | |
| | ED | Exposure Duration | years | 6 | EPA, 1991 | | | |
| | ET | Exposure Time | hour/day | 1 | EPA, 1997a | | | |
| | BW | Body Weight | kg | 15 | EPA, 1991 | | | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | | | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,190 | EPA, 1989 | | | |
| Dermal | CW | Chemical Concentration in Surface Water | mg/L | See Table 3 | See Table 3 | | | CDI (mg/kg-day) = $CS \times SA \times CF1 \times PC \times ET \times EF \times ED \times 1/BW \times 1/AT$ |
| | SA | Skin Surface Area | cm ² | 4,000 | EPA, 1997a (1) | | | |
| | CF1 | Conversion Factor 1 | L/cm ³ | 0.001 | -- | | | |
| | PC | Permeability Constant | cm/hour | See Text | (2) | | | |
| | ET | Exposure Time | hour/day | 1 | EPA, 1997a | | | |
| | EF | Exposure Frequency | days/year | 45 | EPA, 1996a | | | |
| | ED | Exposure Duration | years | 6 | EPA, 1991 | | | |
| | BW | Body Weight | kg | 15 | EPA, 1991 | | | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | | | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,190 | EPA, 1989 | | | |

(1) Professional Judgment

(2) Refer to Section 6.2.3.3.2

Sources:

EPA, 1997a: Exposure Factors Handbook

EPA, 1991: Standard Default Exposure Factors

EPA, 1989: RAGS Part A

EPA 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

38-0080

TABLE 4.4
VALUES USED FOR DAILY INTAKE CALCULATIONS
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Moncrief Creek
Receptor Population: Resident
Receptor Age: Adult

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|----------------|----------------|---|-------------------|-------------|--------------------------|----------|-------------------------|---|
| Ingestion | CW | Chemical Concentration in Surface Water | mg/L | See Table 3 | See Table 3 | | | Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times ET \times 1/BW \times 1/AT$ |
| | IR-W | Ingestion Rate | L/hour | 0.01 | (1) | | | |
| | EF | Exposure Frequency | days/year | 45 | EPA, 1996a | | | |
| | ED | Exposure Duration | years | 24 | EPA, 1991 | | | |
| | ET | Exposure Time | hour/day | 1 | EPA, 1997a | | | |
| | BW | Body Weight | kg | 59 | (2) | | | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | | | |
| | AT-N | Averaging Time (Non-Cancer) | days | - | - | | | |
| Dermal | CW | Chemical Concentration in Surface Water | mg/L | See Table 3 | See Table 3 | | | CDI (mg/kg-day) = $CS \times SA \times CF1 \times PC \times ET \times EF \times$ $ED \times 1/BW \times 1/AT$ |
| | SA | Skin Surface Area | cm ² | 6,170 | EPA, 1997a | | | |
| | CF1 | Conversion Factor 1 | L/cm ² | 0.001 | (1) | | | |
| | PC | Permeability Constant | cm/hour | See Text | (2) | | | |
| | ET | Exposure Time | hour/day | 1 | EPA, 1997a | | | |
| | EF | Exposure Frequency | days/year | 45 | EPA, 1996a | | | |
| | ED | Exposure Duration | years | 24 | EPA, 1991 | | | |
| | BW | Body Weight | kg | 59 | (3) | | | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | | | |
| | AT-N | Averaging Time (Non-Cancer) | days | - | - | | | |

(1) Professional Judgment

(2) Refer to Section

(3) Based on site-specific information and a letter, dated October 11, 2000, from Glenn Adams, US EPA Region 4, to David A. Ludder, Legal Environmental Assistance Foundation.

Sources:

EPA, 1997a: Exposure Factors Handbook

EPA, 1991: Standard Default Exposure Factors

EPA, 1989: RAGS Part A

EPA 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

38 C081

TABLE 4.5
VALUES USED FOR DAILY INTAKE CALCULATIONS
BROWN'S DUMP SITE

Scenario Timeframe: Future
Medium: Water
Exposure Medium: Groundwater
Exposure Point: Showerhead
Receptor Population: Resident
Receptor Age: Child

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|----------------|----------------|---------------------------------------|-----------|-------------|--------------------------|----------|-------------------------|--|
| Ingestion | CW | Chemical Concentration in Groundwater | mg/L | See Table 3 | See Table 3 | | | Chronic Daily Intake (CDI) (mg/kg-day) = $CW \times IR \times EF \times ED \times 1/BW \times 1/AT$ |
| | IR-W | Ingestion Rate of Water | L/day | 1 | EPA, 1997a | | | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | | | |
| | ED | Exposure Duration | years | 6 | EPA, 1991 | | | |
| | BW | Body Weight | kg | 15 | EPA, 1991 | | | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | | | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,190 | EPA, 1989 | | | |

Sources:

EPA 1997a: Exposure Factors Handbook

EPA 1991: Standard Default Exposure Factors

EPA, 1989: RAGS Part A

EPA, 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

TABLE 4.6
VALUES USED FOR DAILY INTAKE CALCULATIONS
BROWN'S DUMP SITE

Scenario Timeframe: Future
Medium: Water
Exposure Medium: Groundwater
Exposure Point: Showerhead
Receptor Population: Resident
Receptor Age: Adult

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|----------------|----------------|---------------------------------------|-----------|-------------|--------------------------|----------|-------------------------|--|
| Ingestion | CW | Chemical Concentration in Groundwater | mg/L | See Table 3 | See Table 3 | | | Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$ |
| | IR-W | Ingestion Rate of Water | L/day | 2 | EPA, 1997a | | | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | | | |
| | ED | Exposure Duration | years | 24 | EPA, 1991 | | | |
| | BW | Body Weight | kg | 59 | (1) | | | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | | | |
| | AT-N | Averaging Time (Non-Cancer) | days | — | — | | | |

(1) Based on site-specific information and a letter, dated October 11, 2000, from Glenn Adams, US EPA Region 4, to David A. Ludder, Legal Environmental Assistance Foundation.

Sources:

EPA, 1997a: Exposure Factors Handbook

EPA, 1991: Standard Default Exposure Factors

EPA, 1989: RAGS Part A

EPA 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

380083

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
BROWN'S DUMP

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD Value | Oral RfD Units | Oral to Dermal Adjustment Factor (1) | Adjusted Dermal RfD (2) | Units | Primary Target Organ | Combined Uncertainty/ Modifying Factors | Sources of RfD: Target Organ | Dates of RfD: Target Organ (3) (MM/DD/YY) |
|---|------------------------|-------------------|-------------------|--|-------------------------------|-----------|----------------------------|--|---------------------------------|---|
| Acenaphthene | Chronic | 6E-02 | mg/kg-day | 50% | 3.0E-02 | mg/kg-day | Liver | 3000 | IRIS | 11/20/2000 |
| Acenaphthylene | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Acetone | Chronic | 1E-01 | mg/kg-day | 83% | 8.3E-02 | mg/kg-day | Liver, Kidney | 1000 | IRIS | 11/20/2000 |
| Aldrin | Chronic | 3E-05 | mg/kg-day | 50% | 1.5E-05 | mg/kg-day | Liver | 1000 | IRIS | 11/20/2000 |
| Alpha BHC (Alpha Hexachlorocyclohexane) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Alpha Endosulfan (Endosulfan I) | Chronic | 6E-03 | mg/kg-day | 50% | 3.0E-003 | mg/kg-day | Kidney | 100 | IRIS | 11/20/2000 |
| Aluminum | Chronic | 1E+00 | mg/kg-day | 10% | 1.0E-01 | mg/kg-day | | | NCEA | 04/13/2000 |
| Anthracene | Chronic | 3E-01 | mg/kg-day | 50% | 1.5E-002 | mg/kg-day | N/A | 3000 | IRIS | 11/20/2000 |
| Antimony | Chronic | 4E-04 | mg/kg-day | 1% | 4.0E-06 | mg/kg-day | Blood | 1000 | IRIS | 11/20/2000 |
| Arsenic | Chronic | 3E-04 | mg/kg-day | 95% | 2.9E-004 | mg/kg-day | Skin | 3 | IRIS | 11/20/2000 |
| Barium | Chronic | 7E-02 | mg/kg-day | 7% | 4.9E-03 | mg/kg-day | Kidney | 3 | IRIS | 11/20/2000 |
| Benzene | Chronic | 3E-03 | mg/kg-day | 97% | 3E-03 | mg/kg-day | | | NCEA | 04/13/2000 |
| Benzo(a)Anthracene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Benzo(a)Pyrene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Benzo(b)Fluoranthene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Benzo(g,h,i)Perylene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Benzo(k)Fluoranthene | Chronic | 1E-02 | mg/kg-day | 80% | 8.0E-03 | mg/kg-day | Liver | 1000 | IRIS | 11/20/2000 |
| Benzyl Butyl Phthalate | Chronic | 2E-01 | mg/kg-day | 50% | 1E-01 | mg/kg-day | Liver | 1000 | IRIS | 11/20/2000 |
| Beryllium | Chronic | 2E-03 | mg/kg-day | 20% | 4.0E-004 | mg/kg-day | Small Intestine | 300 | IRIS | 11/20/2000 |
| Beta BHC (Beta Hexachlorocyclohexane) | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| bis(2-Ethylhexyl)Phthalate | Chronic | 2E-02 | mg/kg-day | 55% | 1.1E-02 | mg/kg-day | Liver | 1000 | IRIS | 11/20/2000 |
| Cadmium | Chronic | 5E-04 | mg/kg-day | 5% | 2.5E-05 | mg/kg-day | Kidney | 10 | IRIS | 11/20/2000 |
| Carbazole | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Carbon Disulfide | Chronic | 1E-01 | mg/kg-day | 80% | 8.0E-002 | mg/kg-day | Fetus | 100 | IRIS | 11/20/2000 |
| Chlorobenzene | Chronic | 2E-02 | mg/kg-day | 31% | 6.2E-003 | mg/kg-day | Liver | 1000 | IRIS | 11/20/2000 |
| Chlordane | Chronic | 5.0E-004 | mg/kg-day | 50% | 2.5E-004 | mg/kg-day | N/A | 300 | IRIS | 11/20/2000 |
| Chloroethane | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Chloroform | Chronic | 1E-02 | mg/kg-day | 80% | 8.0E-003 | mg/kg-day | Liver | 1000 | IRIS | 11/20/2000 |
| Chloromethane | Chronic | 1.6E+00 | ug/l | 100% | | | Lungs | 1000 | IRIS | 11/20/2000 |
| Chromium VI | Chronic | 3E-03 | mg/kg-day | 2% | 6.0E-05 | mg/kg-day | Skin | 900 | IRIS | 11/20/2000 |
| Chrysene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Cobalt | Chronic | 6E-02 | mg/kg-day | 20% | 1.2E-02 | mg/kg-day | | | NCEA | 04/13/2000 |
| Copper | Chronic | 1E+000 | mg/kg-day | 20% | 2.6E-001 | mg/kg-day | GI Tract | 20 | HEAST | 07/01/1997 |
| Cyanide | Chronic | 2E-02 | mg/kg-day | 20% | 4.0E-003 | mg/kg-day | Whole Body | 500 | IRIS | 11/20/2000 |
| p,p'-DDD | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| p,p'-DDE | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| p,p'-DDT | Chronic | 5E-04 | mg/kg-day | 50% | 2.5E-004 | mg/kg-day | Liver | 100 | IRIS | 11/20/2000 |

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
BROWN'S DUMP

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD Value | Oral RfD Units | Oral to Dermal Adjustment Factor (1) | Adjusted Dermal RfD (2) | Units | Primary Target Organ | Combined Uncertainty/ Modifying Factors | Sources of RfD: Target Organ | Dates of RfD: Target Organ (3) (MM/DD/YY) |
|-------------------------------------|------------------------|-------------------|-------------------|--|-------------------------------|-----------|----------------------------|--|---------------------------------|---|
| Dibenz(a,h)Anthracene | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Dibenzofuran | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 1,1-Dichloroethene | Chronic | 1E-01 | mg/kg-day | 80% | 8.0E-02 | mg/kg-day | None Observed | 1000 | HEAST | 07/01/1997 |
| Dieldrin | Chronic | 5E-05 | mg/kg-day | 50% | 2.5E-05 | mg/kg-day | Liver | 100 | IRIS | 11/20/2000 |
| Di-n-Octylphthalate | Chronic | 2E-02 | mg/kg-day | 50% | 1E-02 | mg/kg-day | Kidney/Liver | 1000 | HEAST | 07/01/1997 |
| Endrin | Chronic | 3E-04 | mg/kg-day | 50% | 1.5E-04 | mg/kg-day | Liver | 100 | IRIS | 11/20/2000 |
| Endrin Aldehyde | Chronic | 3E-04 | mg/kg-day | 50% | 1.5E-05 | mg/kg-day | Liver | 100 | IRIS | 11/20/2000 |
| Ethylbenzene | Chronic | 1E-01 | mg/kg-day | 80% | 8.0E-02 | mg/kg-day | Liver/Kidney | 1000 | IRIS | 11/20/2000 |
| Fluoranthene | Chronic | 4E-02 | mg/kg-day | 50% | 2.0E-02 | mg/kg-day | Liver | 3000 | IRIS | 11/20/2000 |
| Fluorene | Chronic | 4E-02 | mg/kg-day | 58% | 2.3E-02 | mg/kg-day | Deceased Cell Count | 3000 | IRIS | 11/20/2000 |
| gamma BHC (Lindane) | Chronic | 3E-04 | mg/kg-day | 50% | 1.5E-04 | mg/kg-day | Liver/Kidney | 1000 | IRIS | 11/20/2000 |
| Heptachlor | Chronic | 5E-04 | mg/kg-day | 50% | 2.5E-04 | mg/kg-day | Liver | 300 | IRIS | 11/20/2000 |
| Heptachlor Epoxide | Chronic | 1.3E-05 | mg/kg-day | 50% | 6.5E-06 | mg/kg-day | Liver | 1000 | IRIS | 11/20/2000 |
| Indeno(1,2,3-c,d)Pyrene | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Iron | Chronic | 3E-01 | mg/kg-day | 15% | 4.5E-02 | mg/kg-day | | | NCEA | 04/13/2000 |
| Isopropylbenzene (Cumene) | Subchronic | 4E-01 | mg/kg-day | 80% | 3.2E-01 | mg/kg-day | Kidney | 300 | HEAST | 07/01/1997 |
| Lead | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| M, P-Xylene | Chronic | 2E+00 | mg/kg-day | 80% | 1.6E+00 | mg/kg-day | Body Weight | 100 | IRIS | 11/20/2000 |
| Manganese (water) | Chronic | 2E-02 | mg/kg-day | 5% | 1.0E-03 | mg/kg-day | CNS | 3 | IRIS | 11/20/2000 |
| Manganese (soil) | Chronic | 7E-02 | mg/kg-day | 5% | 3.5E-03 | mg/kg-day | CNS | 1 | N/A | N/A |
| Mercury (elemental) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Methyl Mercury | Chronic | 1E-04 | mg/kg-day | 20% | 2E-05 | mg/kg-day | Nervous System | 10 | IRIS | 11/20/2000 |
| Methyl Ethyl Ketone (2-Butanone) | Chronic | 6E-01 | mg/kg-day | 80% | 4.8E-001 | mg/kg-day | Fetus | 3000 | IRIS | 11/20/2000 |
| Methylene Chloride | Chronic | 6E-02 | mg/kg-day | 80% | 4.8E-002 | mg/kg-day | Liver | 100 | IRIS | 11/20/2000 |
| Naphthalene | Chronic | 2E-02 | mg/kg-day | 50% | 1.0E-02 | mg/kg-day | Body Weight | 3000 | IRIS | 11/20/2000 |
| Nickel | Chronic | 2E-02 | mg/kg-day | 27% | 5.4E-03 | mg/kg-day | Body Weight | 300 | IRIS | 11/20/2000 |
| O-Xylene | Chronic | 2E+00 | mg/kg-day | 80% | 1.6E+000 | mg/kg-day | Whole Body | 100 | IRIS | 11/20/2000 |
| PCB-1016 (Aroclor 1016) | Chronic | 7E-05 | mg/kg-day | 50% | 2.5E-007 | mg/kg-day | Fetus | 100 | IRIS | 11/20/2000 |
| PCB-1260 (Aroclor 1260) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Pentachlorophenol | Chronic | 3E-02 | mg/kg-day | 50% | 1.5E-002 | mg/kg-day | Liver/Kidney | 100 | IRIS | 11/20/2000 |
| Phenanthrene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Pyrene | Chronic | 3E-02 | mg/kg-day | 87% | 2.6E-002 | mg/kg-day | Kidney | 3000 | IRIS | 11/20/2000 |
| Selenium | Chronic | 5E-03 | mg/kg-day | 20% | 1.0E-003 | mg/kg-day | Whole Body | 3 | IRIS | 11/20/2000 |
| Silver | Chronic | 5E-03 | mg/kg-day | 20% | 1.0E-03 | mg/kg-day | Skin | 3 | IRIS | 11/20/2000 |
| TEQ of 2,3,7,8-TCDD | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Thallium | Chronic | 8E-05 | mg/kg-day | 15% | 1.2E-05 | mg/kg-day | NOAEL | 3000 | IRIS | 11/20/2000 |
| Toluene | Chronic | 2E-01 | mg/kg-day | 80% | 1.6E-001 | mg/kg-day | Liver/Kidney | 1000 | IRIS | 11/20/2000 |
| Trichloroethylene (TCE) | Chronic | 6E-03 | mg/kg-day | 100% | 6E-03 | mg/kg-day | | | NCEA | 04/13/2000 |

TABLE 5.1
NON-CANCER TOXICITY DATA – ORAL/DERMAL
BROWN'S DUMP

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD Value | Oral RfD Units | Oral to Dermal Adjustment Factor (1) | Adjusted Dermal RfD (2) | Units | Primary Target Organ | Combined Uncertainty/ Modifying Factors | Sources of RfD: Target Organ | Dates of RfD: Target Organ (3) (MM/DD/YY) |
|-------------------------------------|------------------------|-------------------|-------------------|--|-------------------------------|-----------|----------------------------|--|---------------------------------|---|
| Trichlorofluoromethane | Chronic | 3E-01 | mg/kg-day | 80% | 2.4E-001 | mg/kg-day | Whole Body | 1000 | IRIS | 11/20/2000 |
| Vanadium | Chronic | 7E-03 | mg/kg-day | 20% | 1.4E-03 | mg/kg-day | N/A | 100 | HEAST | 11/20/2000 |
| Xylenes, Total | Chronic | 2E+00 | mg/kg-day | 80% | 1.6E+00 | mg/kg-day | Body Weight | 100 | IRIS | 11/20/2000 |
| Zinc | Chronic | 3E-01 | mg/kg-day | 20% | 6.0E-02 | mg/kg-day | Blood | 3 | IRIS | 11/20/2000 |

N/A = Not Applicable

CNS = Central nervous system

IRIS = Integrated Risk Information System

HEAST = Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

Other = Region III Risk-Based Concentration Table

(1) Refer to RAGS, Part A and text for an explanation.

(2) Provide equation used for derivation.

(3) For IRIS values, provided the date IRIS was searched.

For HEAST values, provided the date of HEAST.

NCEA values obtained from Region III RBC Table, dated 04/13/00.

38.0086

TABLE 5.2
NON-CANCER TOXICITY DATA – INHALATION
BROWN'S DUMP

| Chemical of Potential Concern | Chronic/ Subchronic | Value Inhalation RfC | Units | Adjusted Inhalation RfD (1) | Units | Primary Target Organ | Combined Uncertainty/ Modifying Factors | Sources of RfC/RfD: Target Organ | Dates (2) (MM/DD/YY) |
|-------------------------------|---------------------|----------------------|-------|-----------------------------|-----------|----------------------|---|----------------------------------|----------------------|
| Chloroform | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Ethylbenzene | Chronic | 1E+00 | mg/m3 | 2.9E-01 | mg/kg-day | Developmental | 300 | IRIS | 11/20/2000 |
| (3- and/or 4-)Methylphenol | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Xylene (Total) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Benzo(a)pyrene | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Napthalene | Chronic | 3E-03 | mg/m3 | 9.0E-04 | mg/kg-day | Respiratory Tract | 3000 | IRIS | 11/20/2000 |
| Aldrin | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Dieldrin | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Aluminum | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Antimony | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Arsenic | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Barium | Chronic | N/A | N/A | 1.4E-04 | mg/kg-day | N/A | N/A | N/A | N/A |
| Beryllium | Chronic | 2E-02 | ug/m3 | 5.7E-06 | mg/kg-day | Respiratory Tract | 10 | IRIS | 11/20/2000 |
| Cadmium | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Chloroethane | Chronic | 1E+01 | mg/m3 | 2.9E+00 | mg/kg-day | Fetus | 300 | IRIS | 11/20/2000 |
| Chromium VI | Chronic | 1E-04 | mg/m3 | 2.9E-05 | mg/kg-day | Respiratory Tract | 300 | IRIS | 11/20/2000 |
| Cobalt | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Copper | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 1,4-Dichlorobenzene | Chronic | 8E-01 | mg/m3 | 2.3E-01 | mg/kg-day | Liver | 100 | IRIS | 11/20/2000 |
| Iron | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Lead | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Manganese (soil) | Chronic | 5E-05 | mg/m3 | 1.4E-05 | mg/kg-day | CNS | 1,000 | IRIS | 11/20/2000 |
| Manganese (water) | Chronic | 5E-05 | mg/m3 | 1.4E-05 | mg/kg-day | CNS | 1,000 | IRIS | 11/20/2000 |
| Mercury Chloride | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Mercury (elemental) | Chronic | 3E-04 | mg/m3 | 8.6E-05 | mg/kg-day | Nervous System | 30 | IRIS | 11/20/2000 |
| Methyl Mercury | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Silver | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Nickel | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Thallium | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Vanadium | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Zinc | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

N/A = Not Applicable

CNS = Central nervous system

IRIS = Integrated Risk Information System

HEAST = Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

(1) Explanation of derivation provided in text.

(2) For IRIS values, provided the date IRIS was searched.

For HEAST values, provided the date of HEAST.

TABLE 1
CANCER TOXICITY DATA -- ORAL/DERMAL
BROWN'S DUMP

| Chemical of Potential Concern | Oral Cancer Slope Factor | Oral to Dermal Adjustment Factor | Adjusted Dermal Cancer Slope Factor (1) | Units | Weight of Evidence/ Cancer Guideline Description | Source Target Organ | Date (2) (MM/DD/YY) |
|-------------------------------------|-----------------------------|--|--|---------------|--|------------------------|------------------------|
| Chloroform | 6.1E-03 | 80% | 7.6E-03 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Benzo(a)pyrene | 7.3E+00 | 58% | 1.26E+01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Aldrin | 1.7E+01 | 50% | 3.4E+01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Dieldrin | 1.6E+01 | 50% | 3.2E+01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Arsenic | 1.5E+00 | 95% | 1.6E+00 | (mg/kg-day)-1 | A | IRIS | 11/26/00 |
| Beryllium | N/A | N/A | N/A | N/A | B1 | IRIS | 11/26/00 |
| Cadmium | N/A | N/A | N/A | N/A | B1 | IRIS | 11/26/00 |
| Chromium VI | N/A | N/A | N/A | N/A | A | IRIS | 11/26/00 |
| 1,1-Dichloroethene | 6.0E-01 | 60% | 7.5E+01 | (mg/kg-day)-1 | C | IRIS | 11/26/00 |
| 1,4-Dichlorobenzene | 2.4E-02 | 80% | 3.0E-02 | (mg/kg-day)-1 | C | IRIS | 11/26/00 |
| Alpha BHC | 6.3E+00 | 50% | 1.2E+01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Benzene | 1.5E-02 to 5.5E-02 | 97% | 1.5E-02 to 5.5E-02 | (mg/kg-day)-1 | A | IRIS | 11/26/00 |
| Beta BHC | 1.8E+00 | 91% | 2.0E+00 | (mg/kg-day)-1 | C | IRIS | 11/26/00 |
| bis (2-Ethylhexyl)Phthalate | 1.4E-02 | 55% | 2.5E-02 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Carbazole | 2E-02 | 50% | 4E-02 | (mg/kg-day)-1 | B2 | HEAST | 07/01/97 |
| Chloroform | 6.1E-03 | 80% | 7.6E-03 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Chloromethane | 1.3E-02 | 100% | 1.3E-02 | (mg/kg-day)-1 | C | HEAST | 07/01/97 |
| Gamma BHC (Lindane) | 1.3E+00 | 50% | 2.6E+00 | (mg/kg-day)-1 | B2/C | HEAST | 07/01/97 |
| Chlordane | 3.5E-01 | 50% | 7.0E+01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Heptachlor | 4.5E+00 | 50% | 9.0E+00 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Heptachlor Epoxide | 9.1E+00 | 50% | 1.82E+01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Lead | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Methylene Chloride | 7.5E-03 | 80% | 9.4E-03 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| p,p' - DDD | 2.4E-01 | 50% | 4.8E-01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| p,p' - DDE | 3.4E-01 | 50% | 6.8E-01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| p,p' - DDT | 3.4E-01 | 50% | 6.8E-01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| PCB - 1016 (Aroclor 1016) | 7E-02 | 50% | 1.4E-01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Pentachlorophenol | 1.2E-01 | 50% | 2.4E-01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| TEQ of 2,3,7,8 - TCDD | 1.5E+05 | 50% | 3.0E+05 | (mg/kg-day)-1 | B2 | HEAST | 07/01/97 |
| Trichloroethylene (TCE) | 1.1E-02 | 100% | 1.1E-02 | (mg/kg-day)-1 | | NCEA | 04/13/00 |
| PCB-1260 (Aroclor 1260) | 2.0E+00 | 50% | 4E+00 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |

N/A = Not Available

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA= National Center for Environmental Assessment

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

Weight of Evidence:

Known/Likely

Cannot be Determined

Not Likely

(1) Explanation of derivation provided in Section 4.2.2.2 of the text.

(2) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

NCEA values obtained from Region III RBC Table, dated 04/13/00.

380088

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
BROWN'S DUMP

| Chemical of Potential Concern | Unit Risk | Units | Adjustment (1) | Inhalation Cancer Slope Factor | Units | Weight of Evidence/ Cancer Guideline Description | Source | Date (2) (MM/DD/YY) |
|-------------------------------------|--------------------|-----------|-------------------|-----------------------------------|---------------|--|------------|------------------------|
| Aldrin | 4.9E-03 | (ug/m3)-1 | 3,500 | 1.7E+01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Chloroform | 2.3E-05 | (ug/m3)-1 | 3,500 | 8.1E-02 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Benzo(a)pyrene | | | | | | B2 | IRIS | 11/26/00 |
| Dieldrin | 4.6E-03 | (ug/m3)-1 | 3,500 | 1.6E+01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Arsenic | 4.3E-03 | (ug/m3)-1 | 3,500 | 1.5E+01 | (mg/kg-day)-1 | A | IRIS | 11/26/00 |
| Beryllium | 2.4E-03 | (ug/m3)-1 | 3,500 | 8.4E+00 | (mg/kg-day)-1 | B1 | IRIS | 11/26/00 |
| Cadmium | 1.8E-03 | (ug/m3)-1 | 3,500 | 6.3E+00 | (mg/kg-day)-1 | B1 | IRIS | 11/26/00 |
| Chromium VI | 1.2E-02 | (ug/m3)-1 | 3,500 | 4.2E+01 | (mg/kg-day)-1 | A | IRIS/HEAST | 11/26/00 |
| 1,1-Dichloroethene | 5.0E-05 | (ug/m3)-1 | 3,500 | 1.8E-001 | (mg/kg-day)-1 | C | IRIS | 11/26/00 |
| 1,4-Dichlorobenzene | N/A | N/A | N/A | N/A | N/A | C | HEAST | 07/01/97 |
| Alpha BHC | 1.8E-03 | (ug/m3)-1 | 3,500 | 6.3E+00 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Benzene | 2.2E-06 to 7.8E-06 | (ug/m3)-1 | 3,500 | 7.7E-03 to 2.7E-02 | (mg/kg-day)-1 | A | IRIS | 11/26/00 |
| Carbazole | 5.7E-07 | (ug/m3)-1 | 3,500 | 2.0E-03 | (mg/kg-day)-1 | B2 | HEAST | 07/01/97 |
| Benzo(a)anthracene | N/A | N/A | N/A | N/A | N/A | B2 | IRIS | 11/26/00 |
| Beta BHC | 5.3E-04 | (ug/m3)-1 | 3,500 | 1.9E+00 | (mg/kg-day)-1 | C | IRIS | 11/26/00 |
| Chloromethane | 1.8E-06 | (ug/m3)-1 | 3,500 | 6.3E-03 | (mg/kg-day)-1 | C | HEAST | 07/01/97 |
| Chloroform | 2.3E-05 | (ug/m3)-1 | 3,500 | 8.1E-02 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Chlordane | 1.0E-04 | (ug/m3)-1 | 3,500 | 3.5E-01 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Heptachlor | 1.3E-03 | (ug/m3)-1 | 3,500 | 4.6E+00 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Heptachlor Epoxide | 2.6E-03 | (ug/m3)-1 | 3,500 | 9.1E+00 | (mg/kg-day)-1 | B2 | IRIS | 11/26/00 |
| Lead | N/A | N/A | N/A | N/A | N/A | B2 | IRIS | 11/26/00 |
| p,p'-DDD | N/A | N/A | N/A | N/A | N/A | B2 | IRIS | 11/26/00 |
| p,p'-DDE | N/A | N/A | N/A | N/A | N/A | B2 | IRIS | 11/26/00 |
| p,p'-DDT | N/A | N/A | N/A | N/A | N/A | B2 | IRIS | 11/26/00 |
| Pentachlorophenol | N/A | N/A | N/A | N/A | N/A | B2 | IRIS | 11/26/00 |
| TEQ of 2,3,7,8 - TCDD | 3.3E-11 | (ug/m3)-1 | 3,500 | 1.2E-07 | (mg/kg-day)-1 | B2 | HEAST | 07/01/97 |

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA= National Center for Environmental Assessment

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

Weight of Evidence:

Known/Likely

Cannot be Determined

Not Likely

(1) Explanation of derivation provided in Section 4.2.2.2 of the text.

(2) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

380089

TABLE 7.1.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| | |
|----------------------|------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Unrestricted School Property |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose (2) | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---|---------------------|---------------------------|--------------------|----------------------|-------------------------|-------------------------------|-----------------|
| Ingestion | CPAHs | 2.57E+000 | mg/kg | 2.57E+000 | mg/kg | M | 1.3E-005 | kg/kg-day | -- | mg/kg-day | | | -- |
| | PCB-1260 (Aroclor 1260) | 3.50E-001 | mg/kg | 3.50E-001 | mg/kg | M | 1.3E-005 | kg/kg-day | -- | mg/kg-day | | | -- |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.70E-005 | mg/kg | 1.70E-005 | mg/kg | M | 1.3E-005 | kg/kg-day | -- | mg/kg-day | | | -- |
| | Antimony | 3.30E+000 | mg/kg | 3.30E+000 | mg/kg | M | 1.3E-005 | kg/kg-day | 4E-004 | mg/kg-day | | | 1.1E-001 |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 1.3E-005 | kg/kg-day | 3E-004 | mg/kg-day | | | 2.2E-001 |
| | Barium | 1.20E+002 | mg/kg | 1.20E+002 | mg/kg | M | 1.3E-005 | kg/kg-day | 7E-002 | mg/kg-day | | | 2.2E-002 |
| | Copper | 1.60E+002 | mg/kg | 1.60E+002 | mg/kg | M | 1.3E-005 | kg/kg-day | 4E-002 | mg/kg-day | | | 5.2E-002 |
| | Iron | 1.70E+004 | mg/kg | 1.70E+004 | mg/kg | M | 1.3E-005 | kg/kg-day | 3E-001 | mg/kg-day | | | 7.4E-001 |
| | Lead | 1.79E+002 | mg/kg | 1.79E+002 | mg/kg | M | 1.3E-005 | kg/kg-day | -- | mg/kg-day | | | -- |
| | (Total) | | | | | | | | | | | | 1.1E+000 |
| Dermal | CPAHs | 2.57E+000 | mg/kg | 2.57E+000 | mg/kg | M | 2.6E-006 | kg/kg-day | -- | mg/kg-day | | | -- |
| | PCB-1260 (Aroclor 1260) | 3.50E-001 | mg/kg | 3.50E-001 | mg/kg | M | 2.6E-006 | kg/kg-day | -- | mg/kg-day | | | -- |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.70E-005 | mg/kg | 1.70E-005 | mg/kg | M | 2.6E-006 | kg/kg-day | -- | mg/kg-day | | | -- |
| | Antimony | 3.30E+000 | mg/kg | 3.30E+000 | mg/kg | M | 2.6E-007 | kg/kg-day | 4.0E-006 | mg/kg-day | | | 2.1E-001 |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 2.6E-007 | kg/kg-day | 2.9E-004 | mg/kg-day | | | 4.6E-003 |
| | Barium | 1.20E+002 | mg/kg | 1.20E+002 | mg/kg | M | 2.6E-007 | kg/kg-day | 4.9E-003 | mg/kg-day | | | 6.4E-003 |
| | Copper | 1.60E+002 | mg/kg | 1.60E+002 | mg/kg | M | 2.6E-007 | kg/kg-day | 8.0E-003 | mg/kg-day | | | 5.2E-003 |
| | Iron | 1.70E+004 | mg/kg | 1.70E+004 | mg/kg | M | 2.6E-007 | kg/kg-day | 6.0E-002 | mg/kg-day | | | 7.4E-002 |
| | Lead | 1.79E+002 | mg/kg | 1.79E+002 | mg/kg | M | 2.6E-007 | kg/kg-day | -- | mg/kg-day | | | -- |
| | (Total) | | | | | | | | | | | | 3.0E-001 |

Total Hazard Index Across All Exposure Routes/Pathways

1

- (1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

3
8
0090

TABLE 7.2.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Restricted Area North of the School
Receptor Population: Resident
Receptor Age: Child

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose (2) | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|--|-------------------------------|------------------|------------------|-----------------|-----------------|---|---------------------|---------------------------|--------------------|----------------------|-------------------------|-------------------------------|-----------------|
| Ingestion | CPAHs | 1.13E+000 | mg/kg | 1.13E+000 | mg/kg | M | 1.3E-005 | kg/kg-day | - | mg/kg-day | | | - |
| | Dieldrin | 5.90E-002 | mg/kg | 5.90E-002 | mg/kg | M | 1.3E-005 | kg/kg-day | 5E-005 | mg/kg-day | | | 1.5E-002 |
| | PCB-1260 (Aroclor 1260) | 1.40E+000 | mg/kg | 1.40E+000 | mg/kg | M | 1.3E-005 | kg/kg-day | - | mg/kg-day | | | - |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.80E-005 | mg/kg | 8.80E-005 | mg/kg | M | 1.3E-005 | kg/kg-day | - | mg/kg-day | | | - |
| | Antimony | 1.90E+001 | mg/kg | 1.90E+001 | mg/kg | M | 1.3E-005 | kg/kg-day | 4E-004 | mg/kg-day | | | 6.2E-001 |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 1.3E-005 | kg/kg-day | 3E-004 | mg/kg-day | | | 1.5E+000 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 1.3E-005 | kg/kg-day | 7E-002 | mg/kg-day | | | 2.2E-001 |
| | Cadmium | 8.00E+000 | mg/kg | 8.00E+000 | mg/kg | M | 1.3E-005 | kg/kg-day | 5E-004 | mg/kg-day | | | 2.1E-001 |
| | Chromium VI | 7.90E+001 | mg/kg | 7.90E+001 | mg/kg | M | 1.3E-005 | kg/kg-day | 3E-003 | mg/kg-day | | | 3.4E-001 |
| | Copper | 4.10E+003 | mg/kg | 4.10E+003 | mg/kg | M | 1.3E-005 | kg/kg-day | 4E-002 | mg/kg-day | | | 1.3E+000 |
| | Iron | 1.10E+005 | mg/kg | 1.10E+005 | mg/kg | M | 1.3E-005 | kg/kg-day | 3E-001 | mg/kg-day | | | 4.8E+000 |
| | Lead | 2.26E+003 | mg/kg | 2.26E+003 | mg/kg | M | 1.3E-005 | kg/kg-day | - | mg/kg-day | | | - |
| | Manganese | 7.90E+002 | mg/kg | 7.90E+002 | mg/kg | M | 1.3E-005 | kg/kg-day | 7E-002 | mg/kg-day | | | 1.5E-001 |
| | Vanadium | 2.10E+001 | mg/kg | 2.10E+001 | mg/kg | M | 1.3E-005 | kg/kg-day | 7E-003 | mg/kg-day | | | 3.9E-002 |
| | Zinc | 2.80E+003 | mg/kg | 2.80E+003 | mg/kg | M | 1.3E-005 | kg/kg-day | 3E-001 | mg/kg-day | | | 1.2E-001 |
| | (Total) | | | | | | | | | | | | 9.3E+000 |
| Dermal | CPAHs | 1.13E+000 | mg/kg | 1.13E+000 | mg/kg | M | 2.6E-006 | kg/kg-day | - | mg/kg-day | | | - |
| | Dieldrin | 5.90E-002 | mg/kg | 5.90E-002 | mg/kg | M | 2.6E-006 | kg/kg-day | 2.5E-005 | mg/kg-day | | | 6.1E-003 |
| | PCB-1260 (Aroclor 1260) | 1.40E+000 | mg/kg | 1.40E+000 | mg/kg | M | 2.6E-006 | kg/kg-day | - | mg/kg-day | | | - |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.80E-005 | mg/kg | 8.80E-005 | mg/kg | M | 2.6E-006 | kg/kg-day | - | mg/kg-day | | | - |
| | Antimony | 1.90E+001 | mg/kg | 1.90E+001 | mg/kg | M | 2.6E-007 | kg/kg-day | 4.0E-006 | mg/kg-day | | | 1.2E+000 |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 2.6E-007 | kg/kg-day | 2.9E-004 | mg/kg-day | | | 3.1E-002 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 2.6E-007 | kg/kg-day | 4.9E-003 | mg/kg-day | | | 6.4E-002 |
| | Cadmium | 8.00E+000 | mg/kg | 8.00E+000 | mg/kg | M | 2.6E-007 | kg/kg-day | 2.5E-005 | mg/kg-day | | | 8.3E-002 |
| | Chromium VI | 7.90E+001 | mg/kg | 7.90E+001 | mg/kg | M | 2.6E-007 | kg/kg-day | 6.0E-005 | mg/kg-day | | | 3.4E-001 |
| | Copper | 4.10E+003 | mg/kg | 4.10E+003 | mg/kg | M | 2.6E-007 | kg/kg-day | 8.0E-003 | mg/kg-day | | | 1.3E-001 |
| | Iron | 1.10E+005 | mg/kg | 1.10E+005 | mg/kg | M | 2.6E-007 | kg/kg-day | 4.5E-002 | mg/kg-day | | | 6.4E-001 |
| | Lead | 2.26E+003 | mg/kg | 2.26E+003 | mg/kg | M | 2.6E-007 | kg/kg-day | - | mg/kg-day | | | - |
| | Manganese | 7.90E+002 | mg/kg | 7.90E+002 | mg/kg | M | 2.6E-007 | kg/kg-day | 3.5E-003 | mg/kg-day | | | 5.9E-002 |
| | Vanadium | 2.10E+001 | mg/kg | 2.10E+001 | mg/kg | M | 2.6E-007 | kg/kg-day | 1.4E-003 | mg/kg-day | | | 3.9E-003 |
| | Zinc | 2.80E+003 | mg/kg | 2.80E+003 | mg/kg | M | 2.6E-007 | kg/kg-day | 6.0E-002 | mg/kg-day | | | 1.2E-002 |
| | (Total) | | | | | | | | | | | | 2.6E+000 |
| Total Hazard Index Across All Exposure Routes/Pathways | | | | | | | | | | | | | 12 |

- (1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

380091

TABLE 7.3.RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| | |
|----------------------|-------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Subsurface Soil |
| Exposure Medium: | Subsurface Soil |
| Exposure Point: | Restricted Area North of the School |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose (2) | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|--|-------------------------------|------------------|------------------|-----------------|-----------------|---|---------------------|---------------------------|--------------------|----------------------|-------------------------|-------------------------------|-----------------|
| Ingestion | CPAHs | 1.37E+000 | mg/kg | 1.37E+000 | mg/kg | M | 1.3E-005 | kg/kg-day | -- | mg/kg-day | | | -- |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 9.50E-005 | mg/kg | 9.50E-005 | mg/kg | M | 1.3E-005 | kg/kg-day | -- | mg/kg-day | | | -- |
| | Aluminum | 1.00E+004 | mg/kg | 1.00E+004 | mg/kg | M | 1.3E-005 | kg/kg-day | 1E+000 | mg/kg-day | | | 1.3E-001 |
| | Antimony | 4.10E+001 | mg/kg | 4.10E+001 | mg/kg | M | 1.3E-005 | kg/kg-day | 4E-004 | mg/kg-day | | | 1.3E+000 |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 1.3E-005 | kg/kg-day | 3E-004 | mg/kg-day | | | 3.8E+000 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 1.3E-005 | kg/kg-day | 7E-002 | mg/kg-day | | | 2.2E-001 |
| | Cadmium | 1.30E+001 | mg/kg | 1.30E+001 | mg/kg | M | 1.3E-005 | kg/kg-day | 5E-004 | mg/kg-day | | | 3.4E-001 |
| | Chromium | 1.30E+002 | mg/kg | 1.30E+002 | mg/kg | M | 1.3E-005 | kg/kg-day | 3E-003 | mg/kg-day | | | 5.6E-001 |
| | Copper | 1.30E+003 | mg/kg | 1.30E+003 | mg/kg | M | 1.3E-005 | kg/kg-day | 4E-002 | mg/kg-day | | | 4.2E-001 |
| | Iron | 2.20E+005 | mg/kg | 2.20E+005 | mg/kg | M | 1.3E-005 | kg/kg-day | 3E-001 | mg/kg-day | | | 9.5E+000 |
| | Lead | 2.37E+003 | mg/kg | 2.37E+003 | mg/kg | M | 1.3E-005 | kg/kg-day | -- | mg/kg-day | | | -- |
| | Manganese | 1.40E+003 | mg/kg | 1.40E+003 | mg/kg | M | 1.3E-005 | kg/kg-day | 7E-002 | mg/kg-day | | | 2.6E-001 |
| | Vanadium | 2.40E+001 | mg/kg | 2.40E+001 | mg/kg | M | 1.3E-005 | kg/kg-day | 7E-003 | mg/kg-day | | | 4.5E-002 |
| | (Total) | | | | | | | | | | | | 1.7E+001 |
| Dermal | CPAHs | 1.37E+000 | mg/kg | 1.37E+000 | mg/kg | M | 2.6E-006 | kg/kg-day | -- | mg/kg-day | | | -- |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 9.50E-005 | mg/kg | 9.50E-005 | mg/kg | M | 2.6E-006 | kg/kg-day | -- | mg/kg-day | | | -- |
| | Aluminum | 1.00E+004 | mg/kg | 1.00E+004 | mg/kg | M | 2.6E-007 | kg/kg-day | 1.0E-001 | mg/kg-day | | | 2.6E-002 |
| | Antimony | 4.10E+001 | mg/kg | 4.10E+001 | mg/kg | M | 2.6E-007 | kg/kg-day | 4.0E-006 | mg/kg-day | | | 2.7E+000 |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 2.6E-007 | kg/kg-day | 2.9E-004 | mg/kg-day | | | 7.9E-002 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 2.6E-007 | kg/kg-day | 4.9E-003 | mg/kg-day | | | 6.4E-002 |
| | Cadmium | 1.30E+001 | mg/kg | 1.30E+001 | mg/kg | M | 2.6E-007 | kg/kg-day | 2.5E-005 | mg/kg-day | | | 1.4E-001 |
| | Chromium | 1.30E+002 | mg/kg | 1.30E+002 | mg/kg | M | 2.6E-007 | kg/kg-day | 6.0E-005 | mg/kg-day | | | 5.6E-001 |
| | Copper | 1.30E+003 | mg/kg | 1.30E+003 | mg/kg | M | 2.6E-007 | kg/kg-day | 8.0E-003 | mg/kg-day | | | 4.2E-002 |
| | Iron | 2.20E+005 | mg/kg | 2.20E+005 | mg/kg | M | 2.6E-007 | kg/kg-day | 4.5E-002 | mg/kg-day | | | 1.3E+000 |
| | Lead | 2.37E+003 | mg/kg | 2.37E+003 | mg/kg | M | 2.6E-007 | kg/kg-day | -- | mg/kg-day | | | -- |
| | Manganese | 1.40E+003 | mg/kg | 1.40E+003 | mg/kg | M | 2.6E-007 | kg/kg-day | 3.5E-003 | mg/kg-day | | | 1.0E-001 |
| | Vanadium | 2.40E+001 | mg/kg | 2.40E+001 | mg/kg | M | 2.6E-007 | kg/kg-day | 1.4E-003 | mg/kg-day | | | 4.5E-003 |
| | (Total) | | | | | | | | | | | | 5.0E+000 |
| Total Hazard Index Across All Exposure Routes/Pathways | | | | | | | | | | | | | 22 |

- (1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.1.1
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| | |
|----------------------|----------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Water |
| Exposure Medium: | Surface Water |
| Exposure Point: | Moncrief Creek |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose (2) | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|--|-------------------------------|------------------|------------------|-----------------|-----------------|---|---------------------|---------------------------|--------------------|----------------------|-------------------------|-------------------------------|-----------------|
| Ingestion | Aluminum | 7.00E-002 | mg/L | 7.00E-002 | mg/L | M | 8.2E-005 | kg/kg-day | 1E+000 | mg/kg-day | | | 5.7E-006 |
| | Arsenic | 1.10E-002 | mg/L | 1.10E-002 | mg/L | M | 8.2E-005 | kg/kg-day | 3E-004 | mg/kg-day | | | 3.0E-003 |
| | Barium | 5.00E-002 | mg/L | 5.00E-002 | mg/L | M | 8.2E-005 | kg/kg-day | 7E-002 | mg/kg-day | | | 5.9E-005 |
| | Chromium | 4.00E-003 | mg/L | 4.00E-003 | mg/L | M | 8.2E-005 | kg/kg-day | 3E-003 | mg/kg-day | | | 1.1E-004 |
| | Iron | 6.40E-001 | mg/L | 6.40E-001 | mg/L | M | 8.2E-005 | kg/kg-day | 3E-001 | mg/kg-day | | | 1.7E-004 |
| | Manganese | 2.70E-002 | mg/L | 2.70E-002 | mg/L | M | 8.2E-005 | kg/kg-day | 2E-002 | mg/kg-day | | | 1.1E-004 |
| | (Total) | | | | | | | | | | | | 3.5E-003 |
| Dermal | Aluminum | 7.00E-002 | mg/L | 7.00E-002 | mg/L | M | 3.3E-005 | kg/kg-day | 1.0E-001 | mg/kg-day | | | 2.3E-005 |
| | Arsenic | 1.10E-002 | mg/L | 1.10E-002 | mg/L | M | 3.3E-005 | kg/kg-day | 2.9E-004 | mg/kg-day | | | 1.3E-003 |
| | Barium | 5.00E-002 | mg/L | 5.00E-002 | mg/L | M | 3.3E-005 | kg/kg-day | 4.9E-003 | mg/kg-day | | | 3.4E-004 |
| | Chromium | 4.00E-003 | mg/L | 4.00E-003 | mg/L | M | 3.3E-005 | kg/kg-day | 6.0E-005 | mg/kg-day | | | 2.2E-003 |
| | Iron | 6.40E-001 | mg/L | 6.40E-001 | mg/L | M | 3.3E-005 | kg/kg-day | 4.5E-002 | mg/kg-day | | | 4.7E-004 |
| | Manganese | 2.70E-002 | mg/L | 2.70E-002 | mg/L | M | 3.3E-005 | kg/kg-day | 1.0E-003 | mg/kg-day | | | 8.9E-004 |
| | (Total) | | | | | | | | | | | | 5.2E-003 |
| Total Hazard Index Across All Exposure Routes/Pathways | | | | | | | | | | | | | 0.009 |

- (1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

38-0093

TABLE 7.3.1
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| | |
|----------------------|-------------|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Groundwater |
| Exposure Point: | Tap |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose (2) | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|--|-------------------------------|------------------|------------------|-----------------|-----------------|---|---------------------|---------------------------|--------------------|----------------------|-------------------------|-------------------------------|-----------------|
| Ingestion | Aldrin | 2.6E-005 | mg/L | 2.6E-005 | mg/L | M | 6.4E-002 | kg/kg-day | 3E-005 | mg/kg-day | | | 5.5E-002 |
| | gamma-Chlordane | 1.2E-004 | mg/L | 1.20E-004 | mg/L | M | 6.4E-002 | kg/kg-day | 5E-004 | mg/kg-day | | | 1.5E-002 |
| | Heptachlor | 4.90E-005 | mg/L | 4.90E-005 | mg/L | M | 6.4E-002 | kg/kg-day | 5E-004 | mg/kg-day | | | 6.3E-003 |
| | Heptachlor Epoxide | 2.80E-005 | mg/L | 2.80E-005 | mg/L | M | 6.4E-002 | kg/kg-day | 1.3E-005 | mg/kg-day | | | 1.4E-001 |
| | p,p'-DDE | 7.50E-005 | mg/L | 7.50E-005 | mg/L | M | 6.4E-002 | kg/kg-day | - | mg/kg-day | | | - |
| | PCB-1016 (Aroclor 1016) | 1.30E-003 | mg/L | 1.30E-003 | mg/L | M | 6.4E-002 | kg/kg-day | 7E-005 | mg/kg-day | | | 1.2E+000 |
| | Arsenic | 2.00E-003 | mg/L | 2.00E-003 | mg/L | M | 6.4E-002 | kg/kg-day | 3E-004 | mg/kg-day | | | 4.3E-001 |
| | Iron | 2.17E+000 | mg/L | 2.17E+000 | mg/L | M | 6.4E-002 | kg/kg-day | 3E-001 | mg/kg-day | | | 4.6E-001 |
| | Manganese | 7.95E-002 | mg/L | 7.95E-002 | mg/L | M | 6.4E-002 | kg/kg-day | 2E-002 | mg/kg-day | | | 2.5E-001 |
| | (Total) | | | | | | | | | | | | 2.5E+000 |
| Total Hazard Index Across All Exposure Routes/Pathways | | | | | | | | | | | | | 3 |

- (1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

380094

TABLE B 1.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| | |
|----------------------|------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Unrestricted School Property |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 2.57E+000 | mg/kg | 2.57E+000 | mg/kg | M | 1.1E-006 | kg/kg-day | 7.3E+000 | (mg/kg-day)-1 | | | 2.0E-005 |
| | PCB-1260 (Aroclor 1260) | 3.50E-001 | mg/kg | 3.50E-001 | mg/kg | M | 1.1E-006 | kg/kg-day | 2.0E+000 | (mg/kg-day)-1 | | | 7.7E-007 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.70E-005 | mg/kg | 1.70E-005 | mg/kg | M | 1.1E-006 | kg/kg-day | 1.5E+005 | (mg/kg-day)-1 | | | 2.8E-006 |
| | Antimony | 3.30E+000 | mg/kg | 3.30E+000 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 1.1E-006 | kg/kg-day | 1.5E+000 | (mg/kg-day)-1 | | | 8.4E-006 |
| | Barium | 1.20E+002 | mg/kg | 1.20E+002 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Copper | 1.60E+002 | mg/kg | 1.60E+002 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Iron | 1.70E+004 | mg/kg | 1.70E+004 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Lead | 1.79E+002 | mg/kg | 1.79E+002 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | (Total) | | | | | | | | | | | | 3.2E-005 |
| Dermal | CPAHs | 2.57E+000 | mg/kg | 2.57E+000 | mg/kg | M | 2.1E-007 | kg/kg-day | 1.26E+001 | (mg/kg-day)-1 | | | 6.8E-006 |
| | PCB-1260 (Aroclor 1260) | 3.50E-001 | mg/kg | 3.50E-001 | mg/kg | M | 2.1E-007 | kg/kg-day | 4.0E+000 | (mg/kg-day)-1 | | | 2.9E-007 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.70E-005 | mg/kg | 1.70E-005 | mg/kg | M | 2.1E-007 | kg/kg-day | 3.0E+005 | (mg/kg-day)-1 | | | 1.1E-006 |
| | Antimony | 3.30E+000 | mg/kg | 3.30E+000 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 2.1E-008 | kg/kg-day | 1.6E+000 | (mg/kg-day)-1 | | | 1.7E-007 |
| | Barium | 1.20E+002 | mg/kg | 1.20E+002 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Copper | 1.60E+002 | mg/kg | 1.60E+002 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Iron | 1.70E+004 | mg/kg | 1.70E+004 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Lead | 1.79E+002 | mg/kg | 1.79E+002 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | (Total) | | | | | | | | | | | | 8.3E-006 |
| | | | | | | | | | | | | | 4E-005 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

3
8
0095

TABLE 8.2.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| | |
|----------------------|------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Unrestricted School Property |
| Receptor Population: | Resident |
| Receptor Age: | Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 2.57E+000 | mg/kg | 2.57E+000 | mg/kg | M | 5.6E-007 | kg/kg-day | 7.3E+000 | (mg/kg-day)-1 | | | 1.1E-005 |
| | PCB-1260 (Aroclor 1260) | 3.50E-001 | mg/kg | 3.50E-001 | mg/kg | M | 5.6E-007 | kg/kg-day | 2.0E+000 | (mg/kg-day)-1 | | | 3.9E-007 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.70E-005 | mg/kg | 1.70E-005 | mg/kg | M | 5.6E-007 | kg/kg-day | 1.5E+005 | (mg/kg-day)-1 | | | 1.4E-006 |
| | Antimony | 3.30E+000 | mg/kg | 3.30E+000 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 5.6E-007 | kg/kg-day | 1.5E+000 | (mg/kg-day)-1 | | | 4.3E-006 |
| | Barium | 1.20E+002 | mg/kg | 1.20E+002 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Copper | 1.60E+002 | mg/kg | 1.60E+002 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Iron | 1.70E+004 | mg/kg | 1.70E+004 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Lead | 1.79E+002 | mg/kg | 1.79E+002 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | (Total) | | | | | | | | | | | | 1.7E-005 |
| Dermal | CPAHs | 2.57E+000 | mg/kg | 2.57E+000 | mg/kg | M | 2.7E-007 | kg/kg-day | 1.26E+001 | (mg/kg-day)-1 | | | 8.7E-006 |
| | PCB-1260 (Aroclor 1260) | 3.50E-001 | mg/kg | 3.50E-001 | mg/kg | M | 2.7E-007 | kg/kg-day | 4.0E+000 | (mg/kg-day)-1 | | | 3.8E-007 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.70E-005 | mg/kg | 1.70E-005 | mg/kg | M | 2.7E-007 | kg/kg-day | 3.0E+005 | (mg/kg-day)-1 | | | 1.4E-006 |
| | Antimony | 3.30E+000 | mg/kg | 3.30E+000 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 2.7E-008 | kg/kg-day | 1.6E+000 | (mg/kg-day)-1 | | | 2.2E-007 |
| | Barium | 1.20E+002 | mg/kg | 1.20E+002 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Copper | 1.60E+002 | mg/kg | 1.60E+002 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Iron | 1.70E+004 | mg/kg | 1.70E+004 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Lead | 1.79E+002 | mg/kg | 1.79E+002 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | (Total) | | | | | | | | | | | | 1.1E-005 |
| | | | | | | | | | | | | | 3E-005 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

9600 8 3

TABLE 8.3.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Restricted Area North of the School
Receptor Population: Resident
Receptor Age: Child

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 1.13E+000 | mg/kg | 1.13E+000 | mg/kg | M | 1.1E-006 | kg/kg-day | 7.3E+000 | (mg/kg-day)-1 | | | 9.1E-006 |
| | Dieldrin | 5.90E-002 | mg/kg | 5.90E-002 | mg/kg | M | 1.1E-006 | kg/kg-day | 1.6E+001 | (mg/kg-day)-1 | | | 1.0E-006 |
| | PCB-1260 (Aroclor 1260) | 1.40E+000 | mg/kg | 1.40E+000 | mg/kg | M | 1.1E-006 | kg/kg-day | 2.0E+000 | (mg/kg-day)-1 | | | 3.1E-006 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.8E-005 | mg/kg | 8.80E-005 | mg/kg | M | 1.1E-006 | kg/kg-day | 1.5E+005 | (mg/kg-day)-1 | | | 1.5E-005 |
| | Antimony | 1.90E+001 | mg/kg | 1.90E+001 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 1.1E-006 | kg/kg-day | 1.5E+000 | (mg/kg-day)-1 | | | 5.8E-005 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Cadmium | 8.00E+000 | mg/kg | 8.00E+000 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Chromium | 7.90E+001 | mg/kg | 7.90E+001 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Copper | 4.10E+003 | mg/kg | 4.10E+003 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Iron | 1.10E+005 | mg/kg | 1.10E+005 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Lead | 2.26E+003 | mg/kg | 2.26E+003 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Manganese | 7.90E+002 | mg/kg | 7.90E+002 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Vanadium | 2.10E+001 | mg/kg | 2.10E+001 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Zinc | 2.80E+003 | mg/kg | 2.80E+003 | mg/kg | M | 1.1E-006 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | (Total) | | | | | | | | | | | | 8.6E-005 |
| Dermal | CPAHs | 1.13E+000 | mg/kg | 1.13E+000 | mg/kg | M | 2.1E-007 | kg/kg-day | 1.26E+001 | (mg/kg-day)-1 | | | 3.0E-006 |
| | Dieldrin | 5.90E-002 | mg/kg | 5.90E-002 | mg/kg | M | 2.1E-007 | kg/kg-day | 3.2E+001 | (mg/kg-day)-1 | | | 4.0E-007 |
| | PCB-1260 (Aroclor 1260) | 1.40E+000 | mg/kg | 1.40E+000 | mg/kg | M | 2.1E-007 | kg/kg-day | 4.0E+000 | (mg/kg-day)-1 | | | 1.2E-006 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.80E-005 | mg/kg | 8.80E-005 | mg/kg | M | 2.1E-007 | kg/kg-day | 3.0E+005 | (mg/kg-day)-1 | | | 5.5E-006 |
| | Antimony | 1.90E+001 | mg/kg | 1.90E+001 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 2.1E-008 | kg/kg-day | 1.6E+000 | (mg/kg-day)-1 | | | 1.2E-006 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Copper | 4.10E+003 | mg/kg | 4.10E+003 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Iron | 1.10E+005 | mg/kg | 1.10E+005 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Lead | 2.26E+003 | mg/kg | 2.26E+003 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Manganese | 7.90E+002 | mg/kg | 7.90E+002 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Vanadium | 2.10E+001 | mg/kg | 2.10E+001 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Zinc | 2.80E+003 | mg/kg | 2.80E+003 | mg/kg | M | 2.1E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | (Total) | | | | | | | | | | | | 1.1E-005 |
| | | | | | | | | | | | | | 1E-004 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

380097

TABLE 8.4.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Restricted Area North of the School
Receptor Population: Resident
Receptor Age: Adult

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 1.13E+000 | mg/kg | 1.13E+000 | mg/kg | M | 5.6E-007 | kg/kg-day | 7.3E+000 | (mg/kg-day) ⁻¹ | | | 4.6E-006 |
| | Dieldrin | 5.90E-002 | mg/kg | 5.90E-002 | mg/kg | M | 5.6E-007 | kg/kg-day | 1.6E+001 | (mg/kg-day) ⁻¹ | | | 5.3E-007 |
| | PCB-1260 (Aroclor 1260) | 1.40E+000 | mg/kg | 1.40E+000 | mg/kg | M | 5.6E-007 | kg/kg-day | 2.0E+000 | (mg/kg-day) ⁻¹ | | | 1.6E-006 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.80E-005 | mg/kg | 8.80E-005 | mg/kg | M | 5.6E-007 | kg/kg-day | 1.5E+005 | (mg/kg-day) ⁻¹ | | | 7.4E-006 |
| | Antimony | 1.90E+001 | mg/kg | 1.90E+001 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 5.6E-007 | kg/kg-day | 1.5E+000 | (mg/kg-day) ⁻¹ | | | 2.9E-005 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Cadmium | 8.00E+000 | mg/kg | 8.00E+000 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Chromium | 7.90E+001 | mg/kg | 7.90E+001 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Copper | 4.10E+003 | mg/kg | 4.10E+003 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Iron | 1.10E+005 | mg/kg | 1.10E+005 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Lead | 2.26E+003 | mg/kg | 2.26E+003 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Manganese | 7.90E+002 | mg/kg | 7.90E+002 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Vanadium | 2.10E+001 | mg/kg | 2.10E+001 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Zinc | 2.80E+003 | mg/kg | 2.80E+003 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | (Total) | | | | | | | | | | | | 4.3E-005 |
| Dermal | CPAHs | 1.13E+000 | mg/kg | 1.13E+000 | mg/kg | M | 2.7E-007 | kg/kg-day | 1.26E+001 | (mg/kg-day) ⁻¹ | | | 3.8E-006 |
| | Dieldrin | 5.90E-002 | mg/kg | 5.90E-002 | mg/kg | M | 2.7E-007 | kg/kg-day | 3.2E+001 | (mg/kg-day) ⁻¹ | | | 5.1E-007 |
| | PCB-1260 (Aroclor 1260) | 1.40E+000 | mg/kg | 1.40E+000 | mg/kg | M | 2.7E-007 | kg/kg-day | 4.0E+000 | (mg/kg-day) ⁻¹ | | | 1.5E-006 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.80E-005 | mg/kg | 8.80E-005 | mg/kg | M | 2.7E-007 | kg/kg-day | 3.0E+005 | (mg/kg-day) ⁻¹ | | | 7.1E-006 |
| | Antimony | 1.90E+001 | mg/kg | 1.90E+001 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 2.7E-008 | kg/kg-day | 1.6E+000 | (mg/kg-day) ⁻¹ | | | 1.5E-006 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Cadmium | 8.00E+000 | mg/kg | 8.00E+000 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Chromium | 7.90E+001 | mg/kg | 7.90E+001 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Copper | 4.10E+003 | mg/kg | 4.10E+003 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Iron | 1.10E+005 | mg/kg | 1.10E+005 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Lead | 2.26E+003 | mg/kg | 2.26E+003 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Manganese | 7.90E+002 | mg/kg | 7.90E+002 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Vanadium | 2.10E+001 | mg/kg | 2.10E+001 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Zinc | 2.80E+003 | mg/kg | 2.80E+003 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | (Total) | | | | | | | | | | | | 1.5E-005 |
| | | | | | | | | | | | | | 6E-005 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation

38.0098

TABLE 8.5.RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| | |
|----------------------|-------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Subsurface Soil |
| Exposure Medium: | SubSurface Soil |
| Exposure Point: | Restricted Area North of the School |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 1.37E+000 | mg/kg | 1.37E+000 | mg/kg | M | 1.1E-006 | kg/kg-day | 7.3E+000 | (mg/kg-day)-1 | | | 1.1E-005 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 9.50E-005 | mg/kg | 9.50E-005 | mg/kg | M | 1.1E-006 | kg/kg-day | 1.5E+005 | (mg/kg-day)-1 | | | 1.6E-005 |
| | Aluminum | 1.00E+004 | mg/kg | 1.00E+004 | mg/kg | M | 1.1E-006 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Antimony | 4.10E+001 | mg/kg | 4.10E+001 | mg/kg | M | 1.1E-006 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 1.1E-006 | kg/kg-day | 1.5E+000 | (mg/kg-day)-1 | | | 1.5E-004 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 1.1E-006 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Cadmium | 1.30E+001 | mg/kg | 1.30E+001 | mg/kg | M | 1.1E-006 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Chromium | 1.30E+002 | mg/kg | 1.30E+002 | mg/kg | M | 1.1E-006 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Copper | 1.30E+003 | mg/kg | 1.30E+003 | mg/kg | M | 1.1E-006 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Iron | 2.20E+005 | mg/kg | 2.20E+005 | mg/kg | M | 1.1E-006 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Lead | 2.37E+003 | mg/kg | 2.37E+003 | mg/kg | M | 1.1E-006 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Manganese | 1.40E+003 | mg/kg | 1.40E+003 | mg/kg | M | 1.1E-006 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Vanadium | 2.40E+001 | mg/kg | 2.40E+001 | mg/kg | M | 1.1E-006 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | (Total) | | | | | | | | | | | | 1.7E-004 |
| Dermal | CPAHs | 1.37E+000 | mg/kg | 1.37E+000 | mg/kg | M | 2.1E-007 | kg/kg-day | 1.26E+001 | (mg/kg-day)-1 | | | 3.6E-006 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 9.50E-005 | mg/kg | 9.50E-005 | mg/kg | M | 2.1E-007 | kg/kg-day | 3.0E+005 | (mg/kg-day)-1 | | | 6.0E-006 |
| | Aluminum | 1.00E+004 | mg/kg | 1.00E+004 | mg/kg | M | 2.1E-008 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Antimony | 4.10E+001 | mg/kg | 4.10E+001 | mg/kg | M | 2.1E-008 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 2.1E-008 | kg/kg-day | 1.6E+000 | (mg/kg-day)-1 | | | 3.0E-006 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 2.1E-008 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Cadmium | 1.30E+001 | mg/kg | 1.30E+001 | mg/kg | M | 2.1E-008 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Chromium | 1.30E+002 | mg/kg | 1.30E+002 | mg/kg | M | 2.1E-008 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Copper | 1.30E+003 | mg/kg | 1.30E+003 | mg/kg | M | 2.1E-008 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Iron | 2.20E+005 | mg/kg | 2.20E+005 | mg/kg | M | 2.1E-008 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Lead | 2.37E+003 | mg/kg | 2.37E+003 | mg/kg | M | 2.1E-008 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Manganese | 1.40E+003 | mg/kg | 1.40E+003 | mg/kg | M | 2.1E-008 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | Vanadium | 2.40E+001 | mg/kg | 2.40E+001 | mg/kg | M | 2.1E-008 | kg/kg-day | -- | (mg/kg-day)-1 | | | -- |
| | (Total) | | | | | | | | | | | | 1.3E-005 |
| | | | | | | | | | | | | | 2E-004 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

38 0099

TABLE 8.6 RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| | |
|----------------------|-------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Subsurface Soil |
| Exposure Medium: | SubSurface Soil |
| Exposure Point: | Restricted Area North of the School |
| Receptor Population: | Resident |
| Receptor Age: | Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 1.37E+000 | mg/kg | 1.37E+000 | mg/kg | M | 5.6E-007 | kg/kg-day | 7.3E+000 | (mg/kg-day)-1 | | | 5.6E-006 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 9.50E-005 | mg/kg | 9.50E-005 | mg/kg | M | 5.6E-007 | kg/kg-day | 1.5E+005 | (mg/kg-day)-1 | | | 8.0E-006 |
| | Aluminum | 1.00E+004 | mg/kg | 1.00E+004 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Antimony | 4.10E+001 | mg/kg | 4.10E+001 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 5.6E-007 | kg/kg-day | 1.5E+000 | (mg/kg-day)-1 | | | 7.4E-005 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Cadmium | 1.30E+001 | mg/kg | 1.30E+001 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Chromium | 1.30E+002 | mg/kg | 1.30E+002 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Copper | 1.30E+003 | mg/kg | 1.30E+003 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Iron | 2.20E+005 | mg/kg | 2.20E+005 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Lead | 2.37E+003 | mg/kg | 2.37E+003 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Manganese | 1.40E+003 | mg/kg | 1.40E+003 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Vanadium | 2.40E+001 | mg/kg | 2.40E+001 | mg/kg | M | 5.6E-007 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | (Total) | | | | | | | | | | | | 8.8E-005 |
| Dermal | CPAHs | 1.37E+000 | mg/kg | 1.37E+000 | mg/kg | M | 2.7E-007 | kg/kg-day | 1.26E+001 | (mg/kg-day)-1 | | | 4.7E-006 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 9.50E-005 | mg/kg | 9.50E-005 | mg/kg | M | 2.7E-007 | kg/kg-day | 3.0E+005 | (mg/kg-day)-1 | | | 7.7E-006 |
| | Aluminum | 1.00E+004 | mg/kg | 1.00E+004 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Antimony | 4.10E+001 | mg/kg | 4.10E+001 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 2.7E-008 | kg/kg-day | 1.6E+000 | (mg/kg-day)-1 | | | 3.8E-006 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Cadmium | 1.30E+001 | mg/kg | 1.30E+001 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Chromium | 1.30E+002 | mg/kg | 1.30E+002 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Copper | 1.30E+003 | mg/kg | 1.30E+003 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Iron | 2.20E+005 | mg/kg | 2.20E+005 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Lead | 2.37E+003 | mg/kg | 2.37E+003 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Manganese | 1.40E+003 | mg/kg | 1.40E+003 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Vanadium | 2.40E+001 | mg/kg | 2.40E+001 | mg/kg | M | 2.7E-008 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | (Total) | | | | | | | | | | | | 1.6E-005 |
| | | | | | | | | | | | | | 1.0E-004 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

380100

TABLE 8
CALCULATION OF HAZARD RISKS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| | |
|----------------------|----------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Water |
| Exposure Medium: | Surface Water |
| Exposure Point: | Moncrief Creek |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-----------------|
| Ingestion | Aluminum | 7.00E-002 | mg/L | 7.00E-002 | mg/L | M | 7.0E-006 | kg/kg-day | — | (mg/kg-day)-1 | | | — |
| | Arsenic | 1.10E-002 | mg/L | 1.10E-002 | mg/L | M | 7.0E-006 | kg/kg-day | 1.5E+000 | (mg/kg-day)-1 | | | 1.2E-007 |
| | Barium | 5.0E-002 | mg/L | 5.00E-002 | mg/L | M | 7.0E-006 | kg/kg-day | — | (mg/kg-day)-1 | | | — |
| | Chromium | 4.00E-003 | mg/L | 4.00E-003 | mg/L | M | 7.0E-006 | kg/kg-day | — | (mg/kg-day)-1 | | | — |
| | Iron | 6.40E-001 | mg/L | 6.40E-001 | mg/L | M | 7.0E-006 | kg/kg-day | — | (mg/kg-day)-1 | | | — |
| | Manganese | 2.70E-002 | mg/L | 2.70E-002 | mg/L | M | 7.0E-006 | kg/kg-day | — | (mg/kg-day)-1 | | | — |
| | (Total) | | | | | | | | | | | | 1.2E-007 |
| Dermal | Aluminum | 7.00E-002 | mg/L | 7.00E-002 | mg/L | M | 2.8E-006 | kg/kg-day | — | (mg/kg-day)-1 | | | — |
| | Arsenic | 1.10E-002 | mg/L | 1.10E-002 | mg/L | M | 2.8E-006 | kg/kg-day | 1.6E+000 | (mg/kg-day)-1 | | | 4.9E-008 |
| | Barium | 5.00E-002 | mg/L | 5.00E-002 | mg/L | M | 2.8E-006 | kg/kg-day | — | (mg/kg-day)-1 | | | — |
| | Chromium | 4.00E-003 | mg/L | 4.00E-003 | mg/L | M | 2.8E-006 | kg/kg-day | — | (mg/kg-day)-1 | | | — |
| | Iron | 6.40E-001 | mg/L | 6.40E-001 | mg/L | M | 2.8E-006 | kg/kg-day | — | (mg/kg-day)-1 | | | — |
| | Manganese | 2.70E-002 | mg/L | 2.70E-002 | mg/L | M | 2.8E-006 | kg/kg-day | — | (mg/kg-day)-1 | | | — |
| | (Total) | | | | | | | | | | | | 4.9E-008 |
| | | | | | | | | | | | | | 2E-007 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

38 0101

TABLE 8.8
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| | |
|----------------------|----------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Water |
| Exposure Medium: | Surface Water |
| Exposure Point: | Moncrief Creek |
| Receptor Population: | Resident |
| Receptor Age: | Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-----------------|
| Ingestion | Aluminum | 7.00E-002 | mg/L | 7.00E-002 | mg/L | M | 7.2E-006 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Arsenic | 1.10E-002 | mg/L | 1.10E-002 | mg/L | M | 7.2E-006 | kg/kg-day | 1.5E+000 | (mg/kg-day) ⁻¹ | | | 1.2E-007 |
| | Barium | 5.0E-002 | mg/L | 5.00E-002 | mg/L | M | 7.2E-006 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Chromium | 4.00E-003 | mg/L | 4.00E-003 | mg/L | M | 7.2E-006 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Iron | 6.40E-001 | mg/L | 6.40E-001 | mg/L | M | 7.2E-006 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Manganese | 2.70E-002 | mg/L | 2.70E-002 | mg/L | M | 7.2E-006 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | (Total) | | | | | | | | | | | | 1.2E-007 |
| Dermal | Aluminum | 7.00E-002 | mg/L | 7.00E-002 | mg/L | M | 4.4E-006 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Arsenic | 1.10E-002 | mg/L | 1.10E-002 | mg/L | M | 4.4E-006 | kg/kg-day | 1.6E+000 | (mg/kg-day) ⁻¹ | | | 7.7E-008 |
| | Barium | 5.00E-002 | mg/L | 5.00E-002 | mg/L | M | 4.4E-006 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Chromium | 4.00E-003 | mg/L | 4.00E-003 | mg/L | M | 4.4E-006 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Iron | 6.40E-001 | mg/L | 6.40E-001 | mg/L | M | 4.4E-006 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Manganese | 2.70E-002 | mg/L | 2.70E-002 | mg/L | M | 4.4E-006 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | (Total) | | | | | | | | | | | | 7.7E-008 |
| | | | | | | | | | | | | | 2E-007 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 8.9.
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| | |
|----------------------|-------------|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Groundwater |
| Exposure Point: | Tap |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | Aldrin | 2.6E-005 | mg/L | 2.6E-005 | mg/L | M | 5.5E-003 | kg/kg-day | 1.7E+001 | (mg/kg-day)-1 | | | 2.4E-006 |
| | gamma-Chlordane | 1.2E-004 | mg/L | 1.20E-004 | mg/L | M | 5.5E-003 | kg/kg-day | 3.5E-001 | (mg/kg-day)-1 | | | 2.3E-007 |
| | Heptachlor | 4.90E-005 | mg/L | 4.90E-005 | mg/L | M | 5.5E-003 | kg/kg-day | 4.5E+000 | (mg/kg-day)-1 | | | 1.2E-006 |
| | Heptachlor Epoxida | 2.90E-005 | mg/L | 2.80E-005 | mg/L | M | 5.5E-003 | kg/kg-day | 9.1E+000 | (mg/kg-day)-1 | | | 1.4E-006 |
| | p,p'-DDE | 7.50E-005 | mg/L | 7.50E-005 | mg/L | M | 5.5E-003 | kg/kg-day | 3.4E-001 | (mg/kg-day)-1 | | | 1.4E-007 |
| | PCB-1016 (Aroclor 1016) | 1.30E-003 | mg/L | 1.30E-003 | mg/L | M | 5.5E-003 | kg/kg-day | 7E-02 | (mg/kg-day)-1 | | | 3.9E-007 |
| | Arsenic | 2.00E-003 | mg/L | 2.00E-003 | mg/L | M | 5.5E-003 | kg/kg-day | 1.5E+000 | (mg/kg-day)-1 | | | 1.7E-005 |
| | Iron | 2.17E+000 | mg/L | 2.17E+000 | mg/L | M | 5.5E-003 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | Manganese | 7.95E-002 | mg/L | 7.95E-002 | mg/L | M | 5.5E-003 | kg/kg-day | - | (mg/kg-day)-1 | | | - |
| | (Total) | | | | | | | | | | | | 2.2E-005 |
| | | | | | | | | | | | | | 2E-005 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 8.1
 CALCULATION OF CANCER RISKS
 REASONABLE MAXIMUM EXPOSURE
 BROWN'S DUMP SITE

| | |
|----------------------|-------------|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Groundwater |
| Exposure Point: | Tap |
| Receptor Population: | Resident |
| Receptor Age: | Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | Aldrin | 2.6E-005 | mg/L | 2.6E-005 | mg/L | M | 1.1E-002 | kg/kg-day | 1.7E+001 | (mg/kg-day) ⁻¹ | | | 4.9E-006 |
| | gamma-Chlordane | 1.2E-004 | mg/L | 1.2E-004 | mg/L | M | 1.1E-002 | kg/kg-day | 3.5E-001 | (mg/kg-day) ⁻¹ | | | 4.6E-007 |
| | Heptachlor | 4.90E-005 | mg/L | 4.90E-005 | mg/L | M | 1.1E-002 | kg/kg-day | 4.5E+000 | (mg/kg-day) ⁻¹ | | | 2.4E-006 |
| | Heptachlor Epoxide | 2.80E-005 | mg/L | 2.80E-005 | mg/L | M | 1.1E-002 | kg/kg-day | 9.1E+000 | (mg/kg-day) ⁻¹ | | | 2.8E-006 |
| | p,p'-DDE | 7.50E-005 | mg/L | 7.50E-005 | mg/L | M | 1.1E-002 | kg/kg-day | 3.4E-001 | (mg/kg-day) ⁻¹ | | | 2.8E-007 |
| | PCB-1016 (Aroclor 1016) | 1.30E-003 | mg/L | 1.30E-003 | mg/L | M | 1.1E-002 | kg/kg-day | 7E-02 | (mg/kg-day) ⁻¹ | | | 7.7E-007 |
| | Arsenic | 2.00E-003 | mg/L | 2.00E-003 | mg/L | M | 1.1E-002 | kg/kg-day | 1.5E+000 | (mg/kg-day) ⁻¹ | | | 3.3E-005 |
| | Iron | 2.17E+000 | mg/L | 2.17E+000 | mg/L | M | 1.1E-002 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | Manganese | 7.95E-002 | mg/L | 7.95E-002 | mg/L | M | 1.1E-002 | kg/kg-day | - | (mg/kg-day) ⁻¹ | | | - |
| | (Total) | | | | | | | | | | | | 4.5E-005 |
| | | | | | | | | | | | | | 4E-005 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

**TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE**

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---------------|-----------------|---|---|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Exposure Unit 1 (Unrestricted School Property) | CPAHs | 2.0E-005 | | 6.8E-006 | 2.7E-005 | CPAHs | Unknown | -- | | -- | -- |
| | | | PCB-1260 (Aroclor 1260) | 7.7E-007 | | 2.9E-007 | 1.1E-006 | PCB-1260 (Aroclor 1260) | Unknown | -- | | -- | -- |
| | | | 2,3,7,8-TCDD (TEQ) Dioxin | 2.8E-006 | | 1.1E-006 | 3.9E-006 | 2,3,7,8-TCDD (TEQ) Dioxin | Unknown | -- | | -- | -- |
| | | | Antimony | -- | | -- | -- | Antimony | Blood | 1.1E-001 | | 2.1E-001 | 3.2E-001 |
| | | | Arsenic | 8.4E-006 | | 1.7E-007 | 8.6E-006 | Arsenic | Skin | 2.2E-001 | | 4.6E-003 | 2.2E-001 |
| | | | Barium | -- | | -- | -- | Barium | CVS | 2.2E-002 | | 6.4E-003 | 2.8E-002 |
| | | | Copper | -- | | -- | -- | Copper | GI Tract | 5.2E-002 | | 5.2E-003 | 5.7E-002 |
| | | | Iron | -- | | -- | -- | Iron | Unknown | 7.4E-001 | | 7.4E-002 | 8.1E-001 |
| | | | Lead | -- | | -- | -- | Lead | Unknown | -- | | -- | -- |
| | | | (Total) | 3.2E-005 | | 8.3E-006 | 4E-005 | (Total) | | 1.1 | | 0.3 | 1 |
| Surface Water | Surface Water | Moncrief Creek | Aluminum | -- | | -- | -- | Aluminum | Unknown | 5.7E-006 | | 2.3E-005 | 2.9E-005 |
| | | | Arsenic | 1.2E-007 | | 4.9E-008 | 1.7E-007 | Arsenic | Skin | 3.0E-003 | | 1.3E-003 | 4.3E-003 |
| | | | Barium | -- | | -- | -- | Barium | CVS | 5.9E-005 | | 3.4E-004 | 4.0E-004 |
| | | | Chromium | -- | | -- | -- | Chromium | Skin | 1.1E-004 | | 2.2E-003 | 2.3E-003 |
| | | | Iron | -- | | -- | -- | Iron | Unknown | 1.7E-004 | | 4.7E-004 | 6.4E-004 |
| | | | Manganese | -- | | -- | -- | Manganese | CNS | 0.0001 | | 8.9E-004 | 1.0E-003 |
| | | | (Total) | 1.2E-007 | | 4.9E-008 | 2E-007 | (Total) | | 0.0035 | | 0.0052 | 0.009 |
| | | | Total Risk Across All Media and All Exposure Routes | | | | 4E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | 1 | |

| | |
|---------------------|-------|
| Total Skin HI = | 0.2 |
| Total CVS HI = | 0.03 |
| Total Blood HI = | 0.3 |
| Total CNS HI = | 0.001 |
| Total GI Tract HI = | 0.06 |
| Total Unknown HI = | 0.8 |

380105

BLE 9:
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|-------------|-----------------|---|---|-------------------|----------------|----------|-----------------------|---------------------------|----------------------------------|---|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Exposure Unit 1 (Unrestricted School Property) | CPAHs | 2.0E-005 | | 6.8E-006 | 2.7E-005 | CPAHs | Unknown | — | | — | — |
| | | | PCB-1260 (Aroclor 1260) | 7.7E-007 | | 2.9E-007 | 1.1E-006 | PCB-1260 (Aroclor 1260) | Unknown | — | | — | — |
| | | | 2,3,7,8-TCDD (TEQ) Dioxin | 2.8E-006 | | 1.1E-006 | 3.9E-006 | 2,3,7,8-TCDD (TEQ) Dioxin | Unknown | — | | — | — |
| | | | Antimony | — | | — | — | Antimony | Blood | 1.1E-001 | | 2.1E-001 | 3.2E-001 |
| | | | Arsenic | 8.4E-006 | | 1.7E-007 | 8.6E-006 | Arsenic | Skin | 2.2E-001 | | 4.6E-003 | 2.2E-001 |
| | | | Barium | — | | — | — | Barium | CVS | 2.2E-002 | | 6.4E-003 | 2.8E-002 |
| | | | Copper | — | | — | — | Copper | GI Tract | 5.2E-002 | | 5.2E-003 | 5.7E-002 |
| | | | Iron | — | | — | — | Iron | Unknown | 7.4E-001 | | 7.4E-002 | 8.1E-001 |
| | | | Lead | — | | — | — | Lead | Unknown | — | | — | — |
| | | | (Total) | 3.2E-005 | | 8.3E-006 | 4E-005 | (Total) | | 1.1 | | 0.3 | 1 |
| | | | Surface Water | Surface Water | Monchief Creek | Aluminum | — | | — | — | Aluminum | Unknown | 5.7E-006 |
| Arsenic | 1.2E-007 | | | | | 4.9E-008 | 1.7E-007 | Arsenic | Skin | 3.0E-003 | | 1.3E-003 | 4.3E-003 |
| Barium | — | | | | | — | — | Barium | CVS | 5.9E-005 | | 3.4E-004 | 4.0E-004 |
| Chromium | — | | | | | — | — | Chromium | Skin | 1.1E-004 | | 2.2E-003 | 2.3E-003 |
| Iron | — | | | | | — | — | Iron | Unknown | 1.7E-004 | | 4.7E-004 | 6.4E-004 |
| Manganese | — | | | | | — | — | Manganese | CNS | 1.1E-004 | | 8.9E-004 | 1.0E-003 |
| (Total) | 1.2E-007 | | | | | 4.9E-008 | 2E-007 | (Total) | | 0.0035 | | 0.0052 | 0.009 |
| Groundwater | Groundwater | Tap | Aldrin | 2.4E-006 | | | 2.4E-006 | Aldrin | Liver | 5.5E-002 | | | 5.5E-002 |
| | | | gamma-Chlordane | 2.3E-007 | | | 2.3E-007 | gamma-Chlordane | Unknown | 1.5E-002 | | | 1.5E-002 |
| | | | Heptachlor | 1.2E-006 | | | 1.2E-006 | Heptachlor | Liver | 6.3E-003 | | | 6.3E-003 |
| | | | Heptachlor Epoxide | 1.4E-006 | | | 1.4E-006 | Heptachlor Epoxide | Liver | 1.4E-001 | | | 1.4E-001 |
| | | | p,p'-DDE | 1.4E-007 | | | 1.4E-007 | p,p'-DDE | Unknown | — | | | — |
| | | | PCB-1016 (Aroclor 1016) | 3.9E-007 | | | 3.9E-007 | PCB-1016 (Aroclor 1016) | Fetus | 1.2E+000 | | | 1.2E+000 |
| | | | Arsenic | 1.7E-005 | | | 1.7E-005 | Arsenic | Fetus | 4.3E-001 | | | 4.3E-001 |
| | | | Iron | — | | | — | Iron | Kidney | 4.6E-001 | | | 4.6E-001 |
| | | | Manganese | — | | | — | Manganese | Unknown | 2.5E-001 | | | 2.5E-001 |
| | | | (Total) | 2.2E-005 | | | 2E-005 | (Total) | | 2.5 | | | 3 |
| | | | Total Risk Across All Media and All Exposure Routes | | | | | | 6E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | |

| | |
|---------------------|-------|
| Total Skin HI = | 0.2 |
| Total CVS HI = | 0.03 |
| Total Kidney HI = | 0.5 |
| Total CNS HI = | 0.001 |
| Total Liver HI = | 0.2 |
| Total Fetus HI = | 1.6 |
| Total Blood HI = | 0.3 |
| Total GI Tract HI = | 0.06 |
| Total Unknown HI = | 1 |

38 0106

3LE 9:
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|--|-------------------------------|-------------------|------------|----------|---|-------------------------------|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Exposure Unit 2 (Restricted Area North of the School) | CPAHs | 9.1E-006 | | 3.0E-006 | 1.2E-005 | CPAHs | Unknown | - | | - | - |
| | | | Dieldrin | 1.00E-006 | | 4.0E-007 | 1.4E-006 | Dieldrin | Unknown | 1.5E-002 | | 6.1E-003 | 2.1E-002 |
| | | | PCB-1260 (Aroclor 1260) | 3.1E-006 | | 1.2E-006 | 4.3E-006 | PCB-1260 (Aroclor 1260) | Unknown | - | | - | - |
| | | | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.5E-005 | | 5.5E-006 | 2.1E-005 | 2,3,7,8-TCDD (TEQ) - (Dioxin) | Unknown | - | | - | - |
| | | | Antimony | - | | - | - | Antimony | Blood | 6.2E-001 | | 1.2E+000 | 1.8E+000 |
| | | | Arsenic | 5.8E-005 | | 1.2E-006 | 5.9E-005 | Arsenic | Skin | 1.5E+000 | | 3.1E-002 | 1.5E+000 |
| | | | Barium | - | | - | - | Barium | CVS | 2.2E-001 | | 6.4E-002 | 2.8E-001 |
| | | | Cadmium | - | | - | - | Cadmium | Kidney | 2.1E-001 | | 8.3E-002 | 2.9E-001 |
| | | | Chromium | - | | - | - | Chromium | Skin | 3.4E-001 | | 3.4E-001 | 6.8E-001 |
| | | | Copper | - | | - | - | Copper | Skin | 1.3E+000 | | 1.3E-001 | 1.4E+000 |
| | | | Iron | - | | - | - | Iron | Unknown | 4.8E+000 | | 6.4E-001 | 5.4E+000 |
| | | | Lead | - | | - | - | Lead | Unknown | - | | - | - |
| | | | Manganese | - | | - | - | Manganese | CNS | 1.5E-001 | | 5.9E-002 | 2.1E-001 |
| | | | Vanadium | - | | - | - | Vanadium | Unknown | 3.9E-002 | | 3.9E-003 | 4.3E-002 |
| | | | Zinc | - | | - | - | Zinc | Blood | 1.2E-001 | | 1.2E-002 | 1.3E-001 |
| | | | | | (Total) | 8.6E-005 | | 1.1E-005 | 1E-004 | (Total) | | 9.3 | |
| Surface Water | Surface Water | Moncrief Creek | Aluminum | - | | - | - | Aluminum | Unknown | 5.7E-006 | | 2.3E-005 | 2.9E-005 |
| | | | Arsenic | 1.2E-007 | | 4.9E-008 | 1.7E-007 | Arsenic | Skin | 3.0E-003 | | 1.3E-003 | 4.3E-003 |
| | | | Barium | - | | - | - | Barium | CVS | 5.9E-005 | | 3.4E-004 | 4.0E-004 |
| | | | Chromium | - | | - | - | Chromium | Skin | 1.1E-004 | | 2.2E-003 | 2.3E-003 |
| | | | Iron | - | | - | - | Iron | Unknown | 1.7E-004 | | 4.7E-004 | 6.4E-004 |
| | | | Manganese | - | | - | - | Manganese | CNS | 1.1E-004 | | 8.9E-004 | 1.0E-003 |
| | | | | (Total) | 1.2E-007 | | 4.9E-008 | 2E-007 | (Total) | | 0.0035 | | 0.0052 |
| Total Risk Across All Media and All Exposure Routes | | | | | | 1E-004 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | 12 |

| | |
|--------------------|-----|
| Total Blood HI = | 0.8 |
| Total Skin HI = | 4 |
| Total CVS HI = | 0.3 |
| Total Kidney HI = | 0.3 |
| Total CNS HI = | 0.2 |
| Total Unknown HI = | 5.5 |

380107

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | |
|---|-----------------|--|-------------------------------|-------------------|------------|----------|---|-------------------------------|----------------------------------|-----------|------------|----------|-----------------------|--------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | |
| Soil | Surface Soil | Exposure Unit 2 (Restricted Area North of the School) | CPAHs | 9.1E-006 | | 3.0E-006 | 1.2E-005 | CPAHs | Unknown | — | | — | — | |
| | | | Dieldrin | 1.00E-006 | | 4.0E-007 | 1.4E-006 | Dieldrin | Unknown | 1.5E-002 | | 6.1E-003 | 2.1E-002 | |
| | | | PCB-1260 (Aroclor 1260) | 3.1E-006 | | 1.2E-006 | 4.3E-006 | PCB-1260 (Aroclor 1260) | Unknown | — | | — | — | |
| | | | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.5E-005 | | 5.5E-006 | 2.1E-005 | 2,3,7,8-TCDD (TEQ) - (Dioxin) | Unknown | — | | — | — | |
| | | | Antimony | — | | — | — | Antimony | Blood | 6.2E-001 | | 1.2E+000 | 1.8E+000 | |
| | | | Arsenic | 5.8E-005 | | 1.2E-006 | 5.9E-005 | Arsenic | Skin | 1.5E+000 | | 3.1E-002 | 1.5E+000 | |
| | | | Barium | — | | — | — | Barium | CVS | 2.2E-001 | | 6.4E-002 | 2.8E-001 | |
| | | | Cadmium | — | | — | — | Cadmium | Kidney | 2.1E-001 | | 8.3E-002 | 2.9E-001 | |
| | | | Chromium | — | | — | — | Chromium | Skin | 3.4E-001 | | 3.4E-001 | 6.8E-001 | |
| | | | Copper | — | | — | — | Copper | Skin | 1.3E+000 | | 1.3E-001 | 1.4E+000 | |
| | | | Iron | — | | — | — | Iron | Unknown | 4.8E+000 | | 6.4E-001 | 5.4E+000 | |
| | | | Lead | — | | — | — | Lead | Unknown | — | | — | — | |
| | | | Manganese | — | | — | — | Manganese | CNS | 1.5E-001 | | 5.9E-002 | 2.1E-001 | |
| | | | Vanadium | — | | — | — | Vanadium | Unknown | 3.9E-002 | | 3.9E-003 | 4.3E-002 | |
| | | | Zinc | — | | — | — | Zinc | Blood | 1.2E-001 | | 1.2E-002 | 1.3E-001 | |
| | | | (Total) | | | 8.6E-005 | | 1.1E-005 | 1E-004 | (Total) | | | | 9.3 |
| Surface Water | Surface Water | Moncrief Creek | Aluminum | — | | — | — | Aluminum | Unknown | 5.7E-006 | | 2.3E-005 | 2.9E-005 | |
| | | | Arsenic | 1.2E-007 | | 4.9E-008 | 1.7E-007 | Arsenic | Skin | 3.0E-003 | | 1.3E-003 | 4.3E-003 | |
| | | | Barium | — | | — | — | Barium | CVS | 5.8E-005 | | 3.4E-004 | 4.0E-004 | |
| | | | Chromium | — | | — | — | Chromium | Skin | 1.1E-004 | | 2.2E-003 | 2.3E-003 | |
| | | | Iron | — | | — | — | Iron | Unknown | 1.7E-004 | | 4.7E-004 | 6.4E-004 | |
| | | | Manganese | — | | — | — | Manganese | CNS | 1.1E-004 | | 8.9E-004 | 1.0E-003 | |
| | | | (Total) | | | 1.2E-007 | | 4.9E-008 | 2E-007 | (Total) | | | | 0.0035 |
| Groundwater | Groundwater | Tap | Aldrin | 2.4E-006 | | | 2.4E-006 | Aldrin | Liver | 5.5E-002 | | | 5.5E-002 | |
| | | | gamma-Chlordane | 2.3E-007 | | | 2.3E-007 | gamma-Chlordane | Unknown | 1.5E-002 | | | 1.5E-002 | |
| | | | Heptachlor | 1.2E-006 | | | 1.2E-006 | Heptachlor | Liver | 6.3E-003 | | | 6.3E-003 | |
| | | | Heptachlor Epoxide | 1.4E-006 | | | 1.4E-006 | Heptachlor Epoxide | Liver | 1.4E-001 | | | 1.4E-001 | |
| | | | p,p'-DDE | 1.4E-007 | | | 1.4E-007 | p,p'-DDE | Unknown | — | | | — | |
| | | | PCB-1016 (Aroclor 1016) | 3.9E-007 | | | 3.9E-007 | PCB-1016 (Aroclor 1016) | Fetus | 1.2E+000 | | | 1.2E+000 | |
| | | | Arsenic | 1.7E-005 | | | 1.7E-005 | Arsenic | Fetus | 4.3E-001 | | | 4.3E-001 | |
| | | | Iron | — | | | — | Iron | Kidney | 4.6E-001 | | | 4.6E-001 | |
| | | | Manganese | — | | | — | Manganese | Unknown | 2.5E-001 | | | 2.5E-001 | |
| | | | (Total) | | | 2.2E-005 | | | 2E-005 | (Total) | | | | 2.5 |
| Total Risk Across All Media and All Exposure Routes | | | | | | 1E-004 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | 14 | |

Total Blood HI = 2
Total Skin HI = 4
Total CVS HI = 0.3
Total Kidney HI = 0.8
Total CNS HI = 0.2
Total Liver HI = 0.2
Total Fetus HI = 1.6
Total Unknown HI = 5.7

3LE 9.1
SUMMARY OF RECEPTOR RISKS - HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---------------|-----------------|--|---|-------------------|------------|----------|-----------------------|-------------------------------|----------------------------------|-----------|---|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Subsurface Soil | Exposure Unit 2 (Restricted Area North of the School) | CPAHs | 1.1E-005 | | 4.3E-006 | 1.5E-005 | CPAHs | Unknown | - | | - | - |
| | | | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.6E-005 | | 6.0E-006 | 2.2E-005 | 2,3,7,8-TCDD (TEQ) - (Dioxin) | Unknown | - | | - | - |
| | | | Aluminum | - | | - | - | Aluminum | Unknown | 1.3E-001 | | 2.6E-002 | 1.6E-001 |
| | | | Antimony | - | | - | - | Antimony | Blood | 1.3E+000 | | 2.7E+000 | 4.0E+000 |
| | | | Arsenic | 1.5E-004 | | 3.0E-006 | 1.5E-004 | Arsenic | Skin | 3.8E+000 | | 7.9E-002 | 3.9E+000 |
| | | | Barium | - | | - | - | Barium | CVS | 2.2E-001 | | 6.4E-002 | 2.8E-001 |
| | | | Cadmium | - | | - | - | Cadmium | Kidney | 3.4E-001 | | 1.4E-001 | 4.8E-001 |
| | | | Chromium | - | | - | - | Chromium | Skin | 5.6E-001 | | 5.6E-001 | 1.1E+000 |
| | | | Copper | - | | - | - | Copper | Skin | 4.2E-001 | | 4.2E-002 | 4.6E-001 |
| | | | Iron | - | | - | - | Iron | Unknown | 9.5E+000 | | 1.3E+000 | 1.1E+001 |
| | | | Lead | - | | - | - | Lead | Unknown | - | | - | - |
| | | | Manganese | - | | - | - | Manganese | CNS | 2.6E-001 | | 1.0E-001 | 3.6E-001 |
| | | | Vanadium | - | | - | - | Vanadium | Unknown | 4.5E-002 | | 4.5E-003 | 5.0E-002 |
| | | | (Total) | 1.8E-004 | | 1.3E-005 | 2E-004 | (Total) | | 17 | | 5 | 22 |
| Surface Water | Surface Water | Moncrief Creek | Aluminum | - | | - | - | Aluminum | Unknown | 5.7E-006 | | 2.3E-005 | 2.9E-005 |
| | | | Arsenic | 1.2E-007 | | 4.9E-008 | 1.7E-007 | Arsenic | Skin | 3.0E-003 | | 1.3E-003 | 4.3E-003 |
| | | | Barium | - | | - | - | Barium | CVS | 5.9E-005 | | 3.4E-004 | 4.0E-004 |
| | | | Chromium | - | | - | - | Chromium | Skin | 1.1E-004 | | 2.2E-004 | 3.3E-004 |
| | | | Iron | - | | - | - | Iron | Unknown | 1.7E-004 | | 4.7E-004 | 6.4E-004 |
| | | | Manganese | - | | - | - | Manganese | CNS | 1.1E-004 | | 8.9E-004 | 1.0E-003 |
| | | | (Total) | 1.2E-007 | | 4.9E-008 | 2E-007 | (Total) | | 0.0035 | | 0.0052 | 0.009 |
| Groundwater | Groundwater | Tap | Aldrin | 2.4E-006 | | - | 2.4E-006 | Aldrin | Liver | 5.5E-002 | | - | 5.5E-002 |
| | | | gamma-Chlordane | 2.3E-007 | | - | 2.3E-007 | gamma-Chlordane | Unknown | 1.5E-002 | | - | 1.5E-002 |
| | | | Heptachlor | 1.2E-006 | | - | 1.2E-006 | Heptachlor | Liver | 6.3E-003 | | - | 6.3E-003 |
| | | | Heptachlor Epoxide | 1.4E-006 | | - | 1.4E-006 | Heptachlor Epoxide | Liver | 1.4E-001 | | - | 1.4E-001 |
| | | | p,p'-DDE | 1.4E-007 | | - | 1.4E-007 | p,p'-DDE | Unknown | - | | - | - |
| | | | PCB-1016 (Aroclor 1016) | 3.9E-007 | | - | 3.9E-007 | PCB-1016 (Aroclor 1016) | Fetus | 1.2E+000 | | - | 1.2E+000 |
| | | | Arsenic | 1.7E-005 | | - | 1.7E-005 | Arsenic | Fetus | 4.3E-001 | | - | 4.3E-001 |
| | | | Iron | - | | - | - | Iron | Kidney | 4.6E-001 | | - | 4.6E-001 |
| | | | Manganese | - | | - | - | Manganese | Unknown | 2.5E-001 | | - | 2.5E-001 |
| | | | (Total) | 2.2E-005 | | - | 2E-005 | (Total) | | 2.5 | | - | 3 |
| | | | Total Risk Across All Media and All Exposure Routes | | | | 2E-004 | | | | Total Hazard Index Across All Media and All Exposure Routes | | |

| | |
|--------------------|-----|
| Total Blood HI = | 4 |
| Total Skin HI = | 5 |
| Total CVS HI = | 0.3 |
| Total Kidney HI = | 1.7 |
| Total CNS HI = | 0.4 |
| Total Liver HI = | 0.1 |
| Total Fetus HI = | 1.6 |
| Total Unknown HI = | 12 |

380109

3LE 9.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---|---------------------------|-------------------|------------|----------|---|----------|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Exposure Unit 1 (Unrestricted School Property) | CPAHs | 1.1E-005 | | 8.7E-006 | 2.0E-005 | | | | | | |
| | | | PCB-1260 (Aroclor 1260) | 3.9E-007 | | 3.8E-007 | 7.7E-007 | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) Dioxin | 1.4E-006 | | 1.4E-006 | 2.8E-006 | | | | | | |
| | | | Antimony | - | | - | - | | | | | | |
| | | | Arsenic | 4.3E-006 | | 2.2E-007 | 4.5E-006 | | | | | | |
| | | | Barium | - | | - | - | | | | | | |
| | | | Copper | - | | - | - | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Lead | - | | - | - | | | | | | |
| | | | (Total) | 1.7E-005 | | 1.1E-005 | 3E-005 | | | | | | |
| Surface Water | Surface Water | Moncrief Creek | Aluminum | - | | - | - | | | | | | |
| | | | Arsenic | 1.2E-007 | | 7.7E-008 | 2.0E-007 | | | | | | |
| | | | Barium | - | | - | - | | | | | | |
| | | | Chromium | - | | - | - | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Manganese | - | | - | - | | | | | | |
| | | | (Total) | 1.2E-007 | | 7.7E-008 | 2E-007 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | 3E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | |

LE 9.7
SUMMARY OF RECEPTOR RISKS - HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---|---------------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Exposure Unit 1 (Unrestricted School Property) | CPAHs | 1.1E-005 | | 8.7E-006 | 2.0E-005 | | | | | | |
| | | | PCB-1260 (Aroclor 1260) | 3.9E-007 | | 3.8E-007 | 7.7E-007 | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) Dioxin | 1.4E-006 | | 1.4E-006 | 2.8E-006 | | | | | | |
| | | | Antimony | -- | | -- | -- | | | | | | |
| | | | Arsenic | 4.3E-006 | | 2.2E-007 | 4.5E-006 | | | | | | |
| | | | Barium | -- | | -- | -- | | | | | | |
| | | | Copper | -- | | -- | -- | | | | | | |
| | | | Iron | -- | | -- | -- | | | | | | |
| | | | Lead | -- | | -- | -- | | | | | | |
| | | | (Total) | 1.7E-005 | | 1.1E-005 | 3E-005 | | | | | | |
| Surface Water | Surface Water | Moncrief Creek | Aluminum | -- | | -- | -- | | | | | | |
| | | | Arsenic | 1.2E-007 | | 7.7E-008 | 2.0E-007 | | | | | | |
| | | | Barium | -- | | -- | -- | | | | | | |
| | | | Chromium | -- | | -- | -- | | | | | | |
| | | | Iron | -- | | -- | -- | | | | | | |
| | | | Manganese | -- | | -- | -- | | | | | | |
| | | | (Total) | 1.2E-007 | | 7.7E-008 | 2E-007 | | | | | | |
| Groundwater | Groundwater | Tap | Aldrin | 4.9E-006 | | | 4.9E-006 | | | | | | |
| | | | gamma-Chlordane | 4.6E-007 | | | 4.6E-007 | | | | | | |
| | | | Heptachlor | 2.4E-006 | | | 2.4E-006 | | | | | | |
| | | | Heptachlor Epoxide | 2.8E-006 | | | 2.8E-006 | | | | | | |
| | | | p,p'-DDE | 2.8E-007 | | | 2.8E-007 | | | | | | |
| | | | PCB-1016 (Aroclor 1016) | 7.7E-007 | | | 7.7E-007 | | | | | | |
| | | | Arsenic | 3.3E-005 | | | 3.3E-005 | | | | | | |
| | | | Iron | -- | | -- | -- | | | | | | |
| | | | Manganese | -- | | -- | -- | | | | | | |
| | | | (Total) | 4.5E-005 | | | 4E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | 7E-005 | | | | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

LE 9.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|--|-------------------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Exposure Unit 2 (Restricted Area North of the School) | CPAHs | 4.6E-006 | | 3.8E-006 | 8.4E-006 | | | | | | |
| | | | Dieldrin | 5.3E-007 | | 5.1E-007 | 1.0E-006 | | | | | | |
| | | | PCB-1260 (Aroclor 1260) | 1.6E-006 | | 1.5E-006 | 3.1E-006 | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 7.4E-006 | | 7.1E-006 | 1.5E-005 | | | | | | |
| | | | Antimony | - | | - | - | | | | | | |
| | | | Arsenic | 2.9E-005 | | 1.5E-006 | 3.1E-005 | | | | | | |
| | | | Barium | - | | - | - | | | | | | |
| | | | Cadmium | - | | - | - | | | | | | |
| | | | Chromium | - | | - | - | | | | | | |
| | | | Copper | - | | - | - | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Lead | - | | - | - | | | | | | |
| | | | Manganese | - | | - | - | | | | | | |
| | | | Vanadium | - | | - | - | | | | | | |
| | | | Zinc | - | | - | - | | | | | | |
| | | | (Total) | 4.3E-005 | | 1.4E-005 | 6E-005 | | | | | | |
| Surface Water | Surface Water | Moncrief Creek | Aluminum | - | | - | - | | | | | | |
| | | | Arsenic | 1.2E-007 | | 7.7E-008 | 2.0E-007 | | | | | | |
| | | | Barium | - | | - | - | | | | | | |
| | | | Chromium | - | | - | - | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Manganese | - | | - | - | | | | | | |
| | | | (Total) | 1.2E-007 | | 7.7E-008 | 2E-007 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 6E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

SUMMARY OF RECEPTOR RISK HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---|-------------------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Exposure Unit 2 (Restricted Area North of the School) | CPAHs | 4.6E-006 | | 3.8E-006 | 8.4E-006 | | | | | | |
| | | | Dieldrin | 5.3E-007 | | 5.1E-007 | 1.0E-006 | | | | | | |
| | | | PCB-1260 (Aroclor 1260) | 1.6E-006 | | 1.5E-006 | 3.1E-006 | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 7.4E-006 | | 7.1E-006 | 1.5E-005 | | | | | | |
| | | | Antimony | - | | - | - | | | | | | |
| | | | Arsenic | 2.9E-005 | | 1.5E-006 | 3.1E-005 | | | | | | |
| | | | Barium | - | | - | - | | | | | | |
| | | | Cadmium | - | | - | - | | | | | | |
| | | | Chromium | - | | - | - | | | | | | |
| | | | Copper | - | | - | - | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Lead | - | | - | - | | | | | | |
| | | | Manganese | - | | - | - | | | | | | |
| | | | Vanadium | - | | - | - | | | | | | |
| | | | Zinc | - | | - | - | | | | | | |
| | | | (Total) | 4.3E-005 | | 1.4E-005 | 6E-005 | | | | | | |
| Surface Water | Surface Water | Moncrief Creek | Aluminum | - | | - | - | | | | | | |
| | | | Arsenic | 1.2E-007 | | 7.7E-008 | 2.0E-007 | | | | | | |
| | | | Barium | - | | - | - | | | | | | |
| | | | Chromium | - | | - | - | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Manganese | - | | - | - | | | | | | |
| | | | (Total) | 1.2E-007 | | 7.7E-008 | 2E-007 | | | | | | |
| Groundwater | Groundwater | Tap | Aldrin | 4.9E-006 | | | 4.9E-006 | | | | | | |
| | | | gamma-Chlordane | 4.6E-007 | | | 4.6E-007 | | | | | | |
| | | | Heptachlor | 2.4E-006 | | | 2.4E-006 | | | | | | |
| | | | Heptachlor Epoxide | 2.8E-006 | | | 2.8E-006 | | | | | | |
| | | | p,p'-DDE | 2.8E-007 | | | 2.8E-007 | | | | | | |
| | | | PCB-1016 (Aroclor 1016) | 7.7E-007 | | | 7.7E-007 | | | | | | |
| | | | Arsenic | 3.3E-005 | | | 3.3E-005 | | | | | | |
| | | | Iron | - | | | - | | | | | | |
| | | | Manganese | - | | | - | | | | | | |
| | | | (Total) | 4.5E-005 | | | 4E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | 1E-004 | | | | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

**SUMMARY OF RECEPTOR RISK HAZARDS FOR COPCs
REASONABLE MAX EXPOSURE
BROWN'S DUMP SITE**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---|-------------------------------|-------------------|------------|----------|---|----------|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Subsurface Soil | Exposure Unit 2 (Restricted Area North of the School) | CPAHs | 5.6E-006 | | 5.5E-006 | 1.1E-005 | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.0E-006 | | 7.7E-006 | 1.6E-005 | | | | | | |
| | | | Aluminum | -- | | -- | -- | | | | | | |
| | | | Antimony | -- | | -- | -- | | | | | | |
| | | | Arsenic | 7.4E-005 | | 3.8E-006 | 7.8E-005 | | | | | | |
| | | | Barium | -- | | -- | -- | | | | | | |
| | | | Cadmium | -- | | -- | -- | | | | | | |
| | | | Chromium | -- | | -- | -- | | | | | | |
| | | | Copper | -- | | -- | -- | | | | | | |
| | | | Iron | -- | | -- | -- | | | | | | |
| | | | Lead | -- | | -- | -- | | | | | | |
| | | | Manganese | -- | | -- | -- | | | | | | |
| | | | Vanadium | -- | | -- | -- | | | | | | |
| | | | (Total) | 8.8E-005 | | 1.7E-005 | 1E-004 | | | | | | |
| Surface Water | Surface Water | Moncrief Creek | Aluminum | -- | | -- | -- | | | | | | |
| | | | Arsenic | 1.2E-007 | | 7.7E-008 | 2.0E-007 | | | | | | |
| | | | Barium | -- | | -- | -- | | | | | | |
| | | | Chromium | -- | | -- | -- | | | | | | |
| | | | Iron | -- | | -- | -- | | | | | | |
| | | | Manganese | -- | | -- | -- | | | | | | |
| | | | (Total) | 1.2E-007 | | 7.7E-008 | 2E-007 | | | | | | |
| Groundwater | Groundwater | Tap | Aldrin | 4.9E-006 | | | 4.9E-006 | | | | | | |
| | | | gamma-Chlordane | 4.6E-007 | | | 4.6E-007 | | | | | | |
| | | | Heptachlor | 2.4E-006 | | | 2.4E-006 | | | | | | |
| | | | Heptachlor Epoxide | 2.8E-006 | | | 2.8E-006 | | | | | | |
| | | | p,p'-DDE | 2.8E-007 | | | 2.8E-007 | | | | | | |
| | | | PCB-1016 (Aroclor 1016) | 7.7E-007 | | | 7.7E-007 | | | | | | |
| | | | Arsenic | 3.3E-005 | | | 3.3E-005 | | | | | | |
| | | | Iron | -- | | | -- | | | | | | |
| | | | Manganese | -- | | | -- | | | | | | |
| | | | (Total) | 4.5E-005 | | | 4E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | 2E-004 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | |

TABLE
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | | |
|---|-----------------|---|---------------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|--|------------|----------------------|--|---------|-----|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | | |
| Soil | Surface Soil | Exposure Unit 1 (Unrestricted School Property) | CPAHs | 2.0E-005 | | 6.8E-006 | 2.7E-005 | Antimony Arsenic | Blood Skin | 1.1E-001 2.2E-001 | | 2.1E-001 4.6E-003 | 3.2E-001 2.2E-001 | | |
| | | | PCB-1260 (Aroclor 1260) | 7.7E-007 | | 2.9E-007 | 1.1E-006 | | | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) Dioxin | 2.8E-006 | | 1.1E-006 | 3.9E-006 | | | | | | | | |
| | | | Arsenic | 8.4E-006 | | 1.7E-007 | 8.6E-006 | | | | | | | | |
| | | | (Total) | 3.2E-005 | | 9.6E-006 | 4E-005 | | | | | | | (Total) | 0.3 |
| Groundwater | Groundwater | Tap | Aldrin | 2.4E-006 | | | 2.4E-006 | Heptachlor Epoxide PCB-1016 (Aroclor 1016) Arsenic Manganese | Liver Fetus Skin CNS | 1.4E-001 1.2E+000 4.3E-001 2.5E-001 | | | 1.4E-001 1.2E+000 4.3E-001 2.5E-001 | | |
| | | | Heptachlor | 1.2E-006 | | | 1.2E-006 | | | | | | | | |
| | | | Heptachlor Epoxide | 1.4E-006 | | | 1.4E-006 | | | | | | | | |
| | | | Arsenic | 1.7E-005 | | | 1.7E-005 | | | | | | | | |
| | | | (Total) | 2.2E-005 | | | 2E-005 | | | | | | | (Total) | 2 |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 6E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | | 2 |

| | |
|-------------------|------|
| Total Skin HI = | 1 |
| Total Blood HI = | 0.3 |
| Total Kidney HI = | 0.3 |
| Total CNS HI = | 0.25 |
| Total Liver HI = | 0.1 |
| Total Fetus HI = | 1.2 |

3
8
0115

TABLE 1
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|--|-------------------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Exposure Unit 2 (Restricted Area North of the School) | CPAHs | 9.1E-006 | | 3.0E-006 | 1.2E-005 | Antimony | Blood | 6.2E-001 | | 1.2E+000 | 1.8E+000 |
| | | | Dieldrin | 1.0E-006 | | 4.0E-007 | 1.4E-006 | Arsenic | Skin | 1.5E+000 | | 3.1E-002 | 1.5E+000 |
| | | | PCB-1260 (Aroclor 1260) | 3.1E-006 | | 1.2E-006 | 4.3E-006 | Barium | CVS | 2.2E-001 | | 6.4E-002 | 2.8E-001 |
| | | | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.5E-005 | | 5.5E-006 | 2.1E-005 | Cadmium | Kidney | 2.1E-001 | | 8.3E-002 | 2.9E-001 |
| | | | Arsenic | 5.8E-005 | | 1.2E-006 | 5.9E-005 | Chromium | Skin | 3.4E-001 | | 3.4E-001 | 6.8E-001 |
| | | | | | | | Copper | Skin | 1.3E+000 | | 1.3E-001 | 1.4E+000 | |
| | | | | | | | Manganese | CNS | 1.5E-001 | | 5.9E-002 | 2.1E-001 | |
| | | | | | | | Zinc | Blood | 1.2E-001 | | 1.2E-002 | 1.3E-001 | |
| | | | | | | | Iron | Unknown | 4.8E+000 | | 6.4E-001 | 5.4E+000 | |
| | | | | | | | Lead | Unknown | - | | - | - | |
| | | (Total) | 8.6E-005 | | 1.1E-005 | 1E-004 | (Total) | | 9.3 | | 3 | 12 | |
| Groundwater | Groundwater | Tap | Aldrin | 2.4E-006 | | | 2.4E-006 | Heptachlor Epoxide | Liver | 1.4E-001 | | | 1.4E-001 |
| | | | Heptachlor | 1.2E-006 | | | 1.2E-006 | PCB-1016 (Aroclor 1016) | Fetus | 1.2E+000 | | | 1.2E+000 |
| | | | Heptachlor Epoxide | 1.4E-006 | | | 1.4E-006 | Arsenic | Skin | 4.3E-001 | | | 4.3E-001 |
| | | | Arsenic | 1.7E-005 | | | 1.7E-005 | Manganese | CNS | 2.5E-001 | | | 2.5E-001 |
| | | | | | | | Iron | Unknown | 1.7E-004 | | | 1.7E-004 | |
| | | | (Total) | 2.2E-005 | | | 2E-005 | (Total) | | 2 | | | 2 |
| Total Risk Across All Media and All Exposure Routes | | | | 1E-004 | | | | Total Hazard Index Across All Media and All Exposure Routes | | | | | 14 |

| | |
|-------------------|-----|
| Total Blood HI = | 7 |
| Total Skin HI = | 4 |
| Total CVS HI = | 0.3 |
| Total Kidney HI = | 0.5 |
| Total CNS HI = | 0.1 |
| Total Liver HI = | 0.1 |
| Total Fetus HI = | 1.2 |

3
8

0116

TABLE
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|--|-------------------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Subsurface Soil | Exposure Unit 2 (Restricted Area North of the School) | CPAHs | 1.1E-005 | | 4.3E-006 | 1.5E-005 | Aluminum | | 1.3E-001 | | 2.6E-002 | 1.6E-001 |
| | | | Arsenic | 1.5E-004 | | 3.0E-006 | 1.5E-004 | Antimony | Blood | 1.3E+000 | | 2.7E+000 | 4.0E+000 |
| | | | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.6E-005 | | 6.0E-005 | 2.2E-005 | Arsenic | Skin | 3.8E+000 | | 7.9E-002 | 3.9E+000 |
| | | | | | | | | Barium | CVS | 2.2E-001 | | 6.4E-002 | 2.8E-001 |
| | | | | | | | | Cadmium | Kidney | 3.4E-001 | | 1.4E-001 | 4.8E-001 |
| | | | | | | | | Chromium | Skin | 5.6E-001 | | 5.6E-001 | 1.1E+000 |
| | | | | | | | | Copper | Skin | 4.2E-001 | | 4.2E-002 | 4.6E-001 |
| | | | | | | | | Lead | - | | - | | - |
| | | | | | | | | Manganese | CNS | 2.6E-001 | | 1.0E-001 | 3.6E-001 |
| | | | | | | | | Iron | Unknown | 4.8E+000 | | 6.4E-001 | 5.4E+000 |
| | | | | | | | | | | | | | |
| | | | (Total) | 1.8E-004 | | 6.7E-005 | 2E-004 | (Total) | 12 | | 4 | 16 | |
| Groundwater | Groundwater | Tap | Aldrin | 2.4E-006 | | | 2.4E-006 | Heptachlor Epoxide | Liver | 1.4E-001 | | | 1.4E-001 |
| | | | Heptachlor | 1.2E-006 | | | 1.2E-006 | PCB-1016 (Aroclor 1016) | Fetus | 1.2E+000 | | | 1.2E+000 |
| | | | Heptachlor Epoxide | 1.4E-006 | | | 1.4E-006 | Arsenic | Skin | 4.3E-001 | | | 4.3E-001 |
| | | | Arsenic | 1.7E-005 | | | 1.7E-005 | Manganese | CNS | 2.5E-001 | | | 2.5E-001 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | (Total) | 2.2E-005 | | | 2E-005 | (Total) | 2 | | | 2 | |
| Total Risk Across All Media and All Exposure Routes | | | | 3E-004 | | | | Total Hazard Index Across All Media and All Exposure Routes | | | | | 18 |

| | |
|-------------------|-----|
| Total Blood HI = | 4 |
| Total Skin HI = | 2 |
| Total CVS HI = | 0.3 |
| Total Kidney HI = | 0.7 |
| Total CNS HI = | 1 |
| Total Liver HI = | 0.1 |
| Total Fetus HI = | 1.2 |

38

0117

TABLE 1
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|-------------|-----------------|---|---|-------------------|------------|----------|-----------------------|----------|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Exposure Unit 1 (Unrestricted School Property) | CPAHs | 1.1E-005 | | 8.7E-006 | 2.0E-005 | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) Dioxin | 1.4E-006 | | 1.4E-006 | 2.8E-006 | | | | | | |
| | | | Arsenic | 4.3E-006 | | 2.2E-007 | 4.5E-006 | | | | | | |
| | | | (Total) | 1.7E-005 | | 1.0E-005 | 3E-005 | | | | | | |
| Groundwater | Groundwater | Tap | Aldrin | 4.9E-006 | | | 4.9E-006 | | | | | | |
| | | | Heptachlor | 2.4E-006 | | | 2.4E-006 | | | | | | |
| | | | Heptachlor Epoxide | 2.8E-006 | | | 2.8E-006 | | | | | | |
| | | | Arsenic | 3.3E-005 | | | 3.3E-005 | | | | | | |
| | | | (Total) | 4.3E-005 | | | 4E-005 | | | | | | |
| | | | Total Risk Across All Media and All Exposure Routes | | | | | | | | | | |

TABLE 1
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|--|-------------------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Exposure Unit 2 (Restricted Area North of the School) | CPAHs | 4.6E-006 | | 3.8E-006 | 8.4E-006 | | | | | | |
| | | | PCB-1260 (Aroclor 1260) | 1.6E-006 | | 1.5E-006 | 3.1E-006 | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 7.4E-006 | | 7.1E-006 | 1.5E-005 | | | | | | |
| | | | Arsenic | 2.9E-005 | | 1.5E-006 | 3.1E-005 | | | | | | |
| | | | (Total) | 4.3E-005 | | 1.4E-005 | 6E-005 | | | | | | |
| Groundwater | Groundwater | Tap | Aldrin | 4.9E-006 | | | 4.9E-006 | | | | | | |
| | | | Heptachlor | 2.4E-006 | | | 2.4E-006 | | | | | | |
| | | | Heptachlor Epoxide | 2.8E-006 | | | 2.8E-006 | | | | | | |
| | | | Arsenic | 3.3E-005 | | | 3.3E-005 | | | | | | |
| | | | (Total) | 4.3E-005 | | | 4E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 1E-004 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

**TABLE 1
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---|-------------------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Subsurface Soil | Exposure Unit 2 (Restricted Area North of the School) | CPAHs | 5.6E-006 | | 5.5E-006 | 1.1E-005 | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.0E-006 | | 7.7E-006 | 1.6E-005 | | | | | | |
| | | | Arsenic | 7.4E-005 | | 3.8E-006 | 7.8E-005 | | | | | | |
| | | | (Total) | 8.8E-005 | | 1.7E-005 | 1E-004 | | | | | | |
| Groundwater | Groundwater | Tap | Aldrin | 4.9E-006 | | | 4.9E-006 | | | | | | |
| | | | Heptachlor | 2.4E-006 | | | 2.4E-006 | | | | | | |
| | | | Heptachlor Epoxide | 2.8E-006 | | | 2.8E-006 | | | | | | |
| | | | Arsenic | 3.3E-005 | | | 3.3E-005 | | | | | | |
| | | | (Total) | 4.3E-005 | | | 4E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 2E-004 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE 11.1
SUMMARY OF NONCARCINOGENIC RISKS
BROWN'S DUMP SITE
JACKSONVILLE, FLORIDA

| Scenario Timeframe | Receptor Population | Exposure Point | Exposure Medium | Exposure Pathway | Pathway Hazard Index |
|-----------------------|------------------------|------------------------|--------------------|--|-------------------------|
| Current | Child Resident | School Property EU1 | Surface Soil | Incidental Ingestion Dermal Contact | 1.1 0.3 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 0.0035 0.0052 |
| | | | | Total Hazard Index | 1 |
| | | | | | |
| Future | Child Resident | School Property EU1 | Surface Soil | Incidental Ingestion Dermal Contact | 1.1 0.3 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 0.0035 0.0052 |
| | | Tap | Groundwater | Ingestion | 2.5 |
| | | | | Total Hazard Index | 4 |
| Current | Child Resident | Fenced Area EU2 | Surface Soil | Incidental Ingestion Dermal Contact | 9.3 2.6 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 0.0035 0.0052 |
| | | | | Total Hazard Index | 12 |
| | | | | | |
| Future | Child Resident | Fenced Area EU2 | Surface Soil | Incidental Ingestion Dermal Contact | 9.3 2.6 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 0.0035 0.0052 |
| | | Tap | Groundwater | Ingestion | 2.5 |
| | | | | Total Hazard Index | 14 |
| Future | Child Resident | Fenced Area EU2 | Subsurface Soil | Incidental Ingestion Dermal Contact | 17 5 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 0.0035 0.0052 |
| | | Tap | Groundwater | Ingestion | 2.5 |
| | | | | Total Hazard Index | 25 |

TABLE 11.2
SUMMARY OF CARCINOGENIC RISKS
BROWN'S DUMP SITE
JACKSONVILLE, FLORIDA

| Scenario Timeframe | Receptor Population | Exposure Point | Exposure Medium | Exposure Pathway | Pathway Risk Index |
|-----------------------|------------------------|------------------------|--------------------|---|-----------------------|
| Current | Child Resident | School Property EU1 | Surface Soil | Incidental Ingestion Dermal Contact | 3.2E-05 8.3E-06 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 1.2E-07 4.9E-08 |
| | | | | Total Incremental Cancer Risk | 4E-05 |
| | | | | | |
| Current | Adult Resident | School Property EU1 | Surface Soil | Incidental Ingestion Dermal Contact | 1.7E-05 1.1E-05 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 1.2E-07 7.7E-08 |
| | | | | Total Incremental Cancer Risk | 3E-05 |
| | | | | Total Incremental Lifetime Cancer Risk | 7E-05 |
| | | | | | |
| Future | Child Resident | School Property EU1 | Surface Soil | Incidental Ingestion Dermal Contact | 3.2E-05 8.3E-06 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 1.2E-07 4.9E-08 |
| | | Tap | Groundwater | Ingestion | 2.2E-05 |
| | | | | Total Incremental Cancer Risk | 6E-05 |
| | | | | | |
| Future | Adult Resident | School Property EU1 | Surface Soil | Incidental Ingestion Dermal Contact | 1.7E-05 1.1E-05 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 1.2E-07 7.7E-08 |
| | | Tap | Groundwater | Ingestion | 4.5E-05 |
| | | | | Total Incremental Cancer Risk | 7E-05 |
| | | | | Total Incremental Lifetime Cancer Risk | 1E-04 |
| | | | | | |
| Current | Child Resident | Fenced Area EU2 | Surface Soil | Incidental Ingestion Dermal Contact | 8.6E-05 1.1E-05 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 1.2E-07 4.9E-08 |
| | | | | Total Incremental Cancer Risk | 1E-04 |
| | | | | | |
| Current | Adult Resident | Fenced Area EU2 | Surface Soil | Incidental Ingestion Dermal Contact | 4.3E-05 1.4E-05 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 1.2E-07 7.7E-08 |
| | | | | Total Incremental Cancer Risk | 6E-05 |
| | | | | Total Incremental Lifetime Cancer Risk | 2E-04 |
| | | | | | |

TABLE 11.2
SUMMARY OF CARCINOGENIC RISKS
BROWN'S DUMP SITE
JACKSONVILLE, FLORIDA

| Scenario Timeframe | Receptor Population | Exposure Point | Exposure Medium | Exposure Pathway | Pathway Risk Index |
|-----------------------|------------------------|--------------------|--------------------|---|-----------------------|
| Future | Child Resident | Fenced Area EU2 | Surface Soil | Incidental Ingestion Dermal Contact | 8.6E-05 1.1E-05 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 1.2E-07 4.9E-08 |
| | | Tap | Groundwater | Ingestion | 2.2E-05 |
| | | | | Total Incremental Cancer Risk | 1E-04 |
| Future | Adult Resident | Fenced Area EU2 | Surface Soil | Incidental Ingestion Dermal Contact | 4.3E-05 1.4E-05 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 1.2E-07 7.7E-08 |
| | | Tap | Groundwater | Ingestion | 4.5E-05 |
| | | | | Total Incremental Cancer Risk | 1E-04 |
| | | | | Total Incremental Lifetime Cancer Risk | 2E-04 |
| Future | Child Resident | Fenced Area EU2 | Subsurface Soil | Incidental Ingestion Dermal Contact | 1.8E-04 1.3E-05 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 1.2E-07 4.9E-08 |
| | | Tap | Groundwater | Ingestion | 2.2E-05 |
| | | | | Total Incremental Cancer Risk | 2E-04 |
| Future | Adult Resident | Fenced Area EU2 | Subsurface Soil | Incidental Ingestion Dermal Contact | 8.8E-05 1.7E-05 |
| | | Moncrief Creek | Surface Water | Incidental Ingestion Dermal Contact | 1.2E-07 7.7E-08 |
| | | Tap | Groundwater | Ingestion | 4.5E-05 |
| | | | | Total Incremental Cancer Risk | 2E-04 |
| | | | | Total Incremental Lifetime Cancer Risk | 4E-04 |

TABLE 12.1
RISK-BASED REMEDIAL GOAL OPTIONS
FUTURE CHILD AND ADULT RESIDENT - SURFACE/SUBSURFACE SOIL
BROWN'S DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

| CHEMICAL | HAZARD INDEX * | | | CARCINOGENIC RISK | | | EPA |
|-------------------------|----------------|--------|--------|-------------------|---------|--------|---------------|
| | (mg/kg) | | | (mg/kg) | | | ARARs (mg/kg) |
| | 0.1 | 1 | 3 | 10-6 | 10-5 | 10-4 | |
| CPAHs [Benzo(a)pyrene] | -- | -- | -- | 0.07 | 0.7 | 7 | -- |
| PCB 1260 (Aroclor 1260) | -- | -- | -- | 0.26 | 2.6 | 26 | -- |
| 2,3,7,8-TCDD (Dioxin) | -- | -- | -- | 0.000003 | 0.00003 | 0.0003 | 0.001** |
| Antimony | 2.9 | 29 | 87 | -- | -- | -- | -- |
| Arsenic | 2.3 | 23 | 69 | 0.59 | 5.9 | 59 | -- |
| Barium | 496 | 4,960 | 14,880 | -- | -- | -- | -- |
| Cadmium | 3.5 | 35 | 105 | -- | -- | -- | -- |
| Copper | 281 | 2,810 | 8,430 | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | 400 ** |
| Manganese | 479 | 4,790 | 14,370 | -- | -- | -- | -- |
| Zinc | 2,121 | 21,210 | 63,630 | -- | -- | -- | -- |

Notes:
* Based on Child Exposure Only.
** These values are based on EPA OSWER Directives.
-- Not Applicable

TABLE 12.2
RISK-BASED REMEDIAL GOAL OPTIONS
FUTURE CHILD AND ADULT RESIDENT - GROUNDWATER
BROWN'S DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

| CHEMICAL | HAZARD INDEX * | | | CARCINOGENIC RISK | | | EPA Maximum Contaminant Levels (MCLs) | Florida MCLs |
|---|----------------|-------|-------|-------------------|------|------|--|--------------|
| | (mg/L) | | | (mg/L) | | | (mg/L) | (mg/L) |
| | 0.1 | 1 | 3 | 10-6 | 10-5 | 10-4 | | |
| PCB 1016 (Aroclor 1016) | 0.0001 | 0.001 | 0.003 | - | - | - | 0.0005 | 0.0005 |
| Manganese | 0.03 | 0.3 | 0.9 | - | - | - | NE | 0.05 |
| Notes: * Based on Child Exposure Only. - Not Applicable | | | | | | | | |

APPENDIX B**Risk Assessments for Residential Areas**

Appendix B

Evaluation of Residential Areas

B.1 Quantitative Evaluation of Surface Soil

Black & Veatch Special Projects Corp. (Black & Veatch) evaluated risks and hazards that may result from exposure to surface soil at residences surrounding the Brown's Dump site. Table B.2.1 lists the chemicals that were detected in the 306 surface soil samples collected from the residential areas of the Brown's Dump site. The maximum detected concentration of the 68 chemicals that were detected in surface soil was compared to the corresponding EPA Region 9 PRG (see Section 2.2 for a detailed discussion of this process). Based on this comparison, 20 chemicals were retained as COPCs in surface soil in the residential areas. COPCs included carcinogenic PAHs, dioxins, aroclor 1260, pesticides, and metals.

The risk assessment assumed that one yard represented an exposure unit for a given receptor. Generally one sample was collected from each yard that was evaluated; therefore, it was assumed that exposure point concentrations in a resident's yard were equal to the detected concentrations of COPCs in the sample collected from that yard.

It was not feasible for the risk assessment to quantitatively evaluate exposure to surface soil from 306 locations (exposure units). Therefore, an attempt was made to identify the most highly contaminated samples so that risks and hazards could be estimated for these locations. It was assumed that risks and hazards resulting from exposure to surface soil at these locations would represent the "worst case scenario" for the yards that were sampled during the RI investigation. To this end, the surface soil analytical data were reviewed to determine which locations had the highest numbers, concentrations, and toxicities (potencies) of chemicals. Based on this review, ten sample locations were selected for quantitative evaluation: BDSB009, BDSB012, BDSB014, BDSB039, BDSB045, BDSB054, BDSB097, BDSB101, BDSB130, and BDSB182 (Tables B.2.2 through B.2.11). With the exception of samples BDSB039, BDSB045, and BDSB054, the samples were collected from various yards around the site (see Figure B-1). Sample BDSB039 was collected from behind a day care center. Samples BDSB045 and BDSB054 were collected from the Moncrief Village Apartments complex. Sample BDSB045 was collected from a common area in the back of the apartments while sample BDSB054 was collected from a common area in the front of the apartments.

According to EPA policy, the target total individual risk resulting from exposures at a Superfund site may range anywhere between 1E-06 and 1E-04 (EPA, 1991). Thus, remedial alternatives should be capable

of reducing total potential carcinogenic risks to levels within this range for individual receptors. According to EPA guidance (1996a), if the hazard index is greater than 1 or the cumulative cancer risk is greater than $1\text{E-}04$ for a land use scenario (i.e., resident), then remedial action is generally warranted. A summary of carcinogenic risks and noncarcinogenic hazards resulting from exposure to each of the ten sample locations is discussed below.

Lead, one of the primary contaminants of concern at the Brown's Dump site, was not included in the quantitative evaluation of risks. As discussed in Section 5.4, there are no toxicity criteria for lead; therefore, lead was evaluated qualitatively by comparing detected concentrations of this metal to EPA's residential soil screening level of 400 mg/kg. Six of the ten surface soil samples (BDSB009, BDSB012, BDSB097, BDSB045, BDSB101, and BDSB54) that were quantitatively evaluated had detected lead concentrations that exceeded 400 mg/kg. The lead concentrations in these six samples ranged from 630 mg/kg (BDSB54) to 39,000 mg/kg (BDSB009). The remaining four samples (BDSB014, BDSB039, BDSB182, and BDSB130) had detected lead concentrations that were below 400 mg/kg. These concentrations ranged from 133 mg/kg (BDSB014) to 340 mg/kg (BDSB130).

All ten samples evaluated as part of this assessment resulted in excess lifetime cancer risks that were within EPA's target risk range of $1\text{E-}06$ to $1\text{E-}04$ (Tables B.9.1 through B.9.20). Exposure to one sample, BDSB097, resulted in an excess lifetime cancer risk ($1\text{E-}04$) that was at the upper end of the target risk range. This risk was primarily due to dioxins and arsenic (Tables B.10.13 and B.10.14). Estimated cancer risks for the remaining nine samples ranged from $9\text{E-}06$ (BDSB0130) to $7\text{E-}05$ (BDSB009) (Tables B.9.1 and B.9.2). These risks were primarily due to dioxins, carcinogenic PAHs, and arsenic in surface soil (Tables B.10.1 through B.10.20).

Five of the ten samples (BDSB012, BDSB097, BDSB054, BDSB045, and BDSB101) generated hazard indices greater than 1. The hazard indices for these five samples ranged from 2 to 8 (Tables B.9.1 through B.9.16). The noncarcinogenic COCs included a variety of metals, including arsenic, antimony, cadmium, mercury and manganese (Tables B.10.3, B.10.9, B.10.11, B.10.13, B.10.15, and B.10.17). The hazard indices for the remaining five samples (BDSB009, BDSB014, BDSB039, BDSB130, and BDSB182) ranged from 0.2 to 1.

EPA standard default exposure assumptions were used to calculate the risks and hazards outlined above. These exposure assumptions are conservative and are likely to overestimate risks.

An exposure unit should be based on the areal extent of a receptor's movements during a single day. Two types of samples were collected during the RI - Tier 1 and Tier 2. Tier 1 samples were discrete samples collected from a single location. Tier 2 samples were composite samples collected from five locations in the yard. If any of the ten samples quantitatively evaluated in the risk assessment were Tier 1 samples, then the resulting risks and hazards are based on exposure to a single location in a given yard. Without additional data, the single sample was assumed to represent the average concentration across the yard. However, since it was only a single sample taken without knowledge of the distribution of contamination across the site, it is likely to be below or above the actual average concentration. This could result in an under- or overestimation of risks in each yard with a Tier 1 sample.

B.2 Quantitative Evaluation of Groundwater

Black & Veatch also evaluated risks and hazards that may result from exposure to groundwater in the future. Table B.2.12 lists the chemicals that were detected in groundwater samples collected from the residential areas of the Brown's Dump site. A total of ten chemicals were retained as COPCs in groundwater. COPCs included aroclor 1016, pesticides, and metals. As with the soil data, the groundwater analytical data for each sample were reviewed to determine which locations had the highest numbers and detected concentrations of COPCs. One well (BDMW010) contained eight COPCs, one well (BDMW04) contained three COPCs, and five wells contained two COPCs (iron and manganese were the COPCs in four of these wells). Based on this review, three wells were selected for quantitative evaluation: BDMW010, BDMW04, and BDMW009 (Tables B.2.13 through B.2.15).

Two of the three groundwater samples evaluated as part of this assessment (BDMW009 and BDMW010) contained carcinogenic compounds. Assuming a resident ingested groundwater from either of these wells resulted in excess lifetime cancer risks that were within EPA's target risk range of $1E-06$ to $1E-04$. Exposure to sample BDMW010 resulted in an excess lifetime cancer risk of $1E-04$ (Tables B.9.25 and B.9.26), primarily due to ingestion of aldrin and heptachlor epoxide (Tables B.10.25 and B.10.26). Exposure to sample BDMW009 resulted in an excess lifetime cancer risk of $9E-05$ (Tables B.9.23 and B.9.24), due to ingestion of arsenic.

Two of the three groundwater samples (BDMW004 and BDMW010) had total HIs above 1, the level of concern for noncarcinogenic chemicals. The total HI in sample BDMW04 was 7 (Table B.9.21), primarily due to ingestion of iron. The total HI in sample BDMW010 was 5 (Table B.9.25), primarily due to ingestion of heptachlor epoxide, aroclor 1016, aldrin, and iron (Table B.10.25). The total HI for sample BDMW009 was 1 (Table B.9.23), due to ingestion of arsenic and iron.

B.3 Qualitative Evaluation of Surface Soil

As stated in Section B.1, it was not feasible to calculate risks for over three hundred exposure units; therefore, 296 surface soil sample locations were not included in the quantitative evaluation. Based on the reduced numbers of COPCs at these locations, it was anticipated that the total risk and hazard at each location would be less than the criteria of concern (i.e., cancer risk of $1\text{E-}04$ or HI of 1). However, the analytical data from each of these 296 locations were evaluated qualitatively by comparing the detected concentration of each COPC to its chemical-specific RGO. If the detected concentration of a chemical was greater than the RGO corresponding to an HQ of 1 or a cancer risk of $1\text{E-}06$, further action may be required at that sample location (e.g., additional sampling, soil removal). A comprehensive list of RGOs is presented in Tables B.11.1 and B.11.2.

The comparison of the analytical data from the 296 surface soil samples to the corresponding chemical-specific RGOs is included in Appendix C. Detected concentrations of COPCs in 266 of the 296 samples were all below RGOs. However, a total of 30 surface soil samples contained COPC concentrations that exceeded at least one RGO. Lead was the only contaminant of concern in twenty-six samples (i.e., lead was the only COPC detected at a concentration that exceeded an RGO). One surface soil location, sample BDSB058, contained both lead and carcinogenic PAHs at concentrations that exceeded their respective RGOs. Carcinogenic PAHs were detected at concentrations that exceeded the RGO of 0.09 mg/kg at two surface soil locations, samples BDSB071 and BDSB340. Sample BDSB104 contained arsenic at a concentration that exceeded its RGO of 23 mg/kg . Lead was detected at concentrations of less than 50 mg/kg in all three of these samples.

Table B.12.1 compares detected concentrations of COPCs in the ten samples that were quantitatively evaluated to their corresponding RGOs. Lead and CPAHs were the only COPCs that repeatedly exceeded the RGOs. One other COPC, aldrin, was detected in sample BDSB012 at a concentration that exceeded its RGO; however, lead and CPAHs were also detected at concentrations exceeding their RGOs at that location.. With the exception of two sample locations (BDSB014 and BDSB039), lead was detected at concentrations exceeding 400 mg/kg in all samples containing CPAHs or aldrin at concentrations above RGOs. Benzo(a)pyrene, a CPAH, was detected at a concentration of 0.17 mg/kg in samples BDSB014 and BDSB039. This concentration is approximately two times higher than the RGO of 0.09 mg/kg . Lead was detected at concentrations below its RGO at both of these locations.

Figure B-1 shows the surface soil sampling locations in the residential areas as well the locations where no samples have been collected. The figure also distinguishes sample locations with detected concentrations below RGOs from sample locations with detected concentrations that were above RGOs.

Lead, one of the primary contaminants of concern at the Brown's Dump site, was analyzed at each of the surface sample locations. Lead concentrations in the surface soil samples collected from the residential areas are shown in Figures B-2 through B-5. As indicated on Figure B-2, the majority of the surface soil samples contained lead concentrations that were less than 200 mg/kg. Lead was detected at concentrations between 200 and 400 mg/kg in 19 surface soil samples (Figure B-4). A total of 33 sample locations contained lead concentrations above the RGO of 400 mg/kg (Figure B-5).

As discussed in Section 2.4, most of the lead samples were analyzed in the field by XRF. A percentage of the lead samples were also submitted to a laboratory for confirmatory analysis. In general, the laboratory results for a sample were 1.2 to 5 times higher than the corresponding XRF result (on average, laboratory results were approximately 2 times higher than XRF results). The evaluation indicated an error of 1.7 percent when XRF lead measurements under 200 mg/kg were compared with corresponding fixed laboratory analytical lead measurements exceeding 400 mg/kg. In other words, 98.3% of XRF samples with less than 200 mg/kg lead also show a lead concentration from a fixed laboratory less than 400 mg/kg, the risk based remedial goal option for lead.

Finally, Table B.13.1 provides the parameters that were used to calculate the risks and hazards at the ten surface soil samples that were quantitatively evaluated. The example calculation at the end of the table can be used as a guide to calculate hazards and risks that may result from exposure to COPCs in any of the surface soil samples that were qualitatively evaluated.

B.4 Qualitative Evaluation of Subsurface Soil

Subsurface soil in the residential areas was evaluated qualitatively since it is not currently available for direct contact. Table B.2.16 lists the chemicals that were detected in the subsurface soil samples collected from the residential areas of the Brown's Dump site. A total of 15 chemicals were retained as COPCs in subsurface soils in the residential area. COPCs included dioxins, carcinogenic PAHs, and metals.

The analytical data from each subsurface soil sample were compared to the chemical-specific RGOs for dioxins, carcinogenic PAHs, and metals. Dioxins were sampled and detected in four subsurface soil samples. Detected concentrations of dioxins in all four samples were below the EPA Region 4 RGO of

1 ug/kg (Table B.11.1). CPAHs were detected in the following samples: BDSB012, BDSB014, BDSB058, BDSB097, and BDSB116. All detected concentrations of CPAHs were greater than 0.09 mg/kg, the RGO corresponding to a risk of 1E-06. The maximum detected concentration of benzo(a)pyrene, a carcinogenic PAH, was 2.4 mg/kg (BDSB012).

Detected concentrations of five of the metals that were retained as COPCs (aluminum, barium, manganese, nickel, and zinc) were below the RGO corresponding to an HQ of 1. However, the following metals were detected in subsurface soil at concentrations that exceeded the RGO corresponding to an HQ of 1 (all units are in mg/kg):

| Constituent | Max. Det. In Subsurface Soil (Sample Location) | RGO* | No. of Detections above RGO. |
|-------------|--|--------|---------------------------------|
| Antimony | 250 (BDSB045) | 29 | 9 |
| Arsenic | 68 (BDSB009) | 23 | 12 |
| Cadmium | 53 (BDSB045) | 35 | 2 |
| Copper | 5,300 (BDSB003) | 2,810 | 3 |
| Iron | 300,000 (BDSB007) | 21,050 | 25 |
| Lead | 300,000 (BDSB045) | 400** | 39 |
| Vanadium | 660 (BDSB014) | 430 | 2 |

* RGO corresponds to a HQ of 1

** EPA's residential screening level for soil.

Lead was detected at concentrations exceeding 400 mg/kg at each subsurface soil location where a chemical-specific RGO was exceeded. In other words, lead was detected at concentrations greater than 400 mg/kg in all five subsurface soil samples where CPAHs exceeded the RGO of 0.09 mg/kg. Lead was also detected at concentrations greater than 400 mg/kg in all 12 subsurface soil samples where arsenic exceeded the RGO of 23 mg/kg, etc.

B.5 Data Gaps

The following data gaps have been identified based on the results of the baseline risk assessment:

- There are residential properties within the site that have not been sampled (see Figure B-1). These properties should be sampled, particularly ones in areas with chemical detections that exceed RGOs.
- Confirmatory analyses may be required for the 17 surface soil sample locations with lead concentrations between 200 and 400 mg/kg (see Figure B-4).

TA 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Soil - Offsite
Exposure Medium: Surface Soil - Offsite
Exposure Point: Residences

| CAS Number | Chemical | Minimum (1) Concentration | Minimum Qualifier | Maximum (1) Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection frequency | Range of Detection Limits | Concentration Used for Screening | Background (2) Value | Screening (3) Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-------------------------|------------------------------|----------------------|------------------------------|----------------------|-------|---|------------------------|---------------------------------|--|-------------------------|---------------------------------|--------------------------------|---------------------------------|--------------|--|
| 67641 | Acetone | 23 | J | 69 | | ug/kg | BDSB097 | 6/17 | 10 - 40 | 69 | NA | 160,000 | N | | no | BSL |
| 71432 | Benzene | 0.6 | J | 4 | J | ug/kg | BDSB130 | 4/18 | 10 - 17 | 4 | NA | 670 | C | | no | BSL |
| 75150 | Carbon Disulfide | 2 | J | 14 | | ug/kg | BDSB014 | 3/17 | 10 - 17 | 14 | NA | 36,000 | N | | no | BSL |
| 100414 | Ethylbenzene | 0.2 | J | 0.8 | J | ug/kg | BDSB097 | 5/8 | 10 - 13 | 0.8 | NA | 230,000 | N | | no | BSL |
| 1330207 | M,P-Xylene | 0.5 | J | 2 | J | ug/kg | BDSB097 | 6/10 | 10 - 11 | 2 | NA | 21,000 | N | | no | BSL |
| 78933 | Methyl Ethyl Ketone | 4 | J | 18 | | ug/kg | BDSB012 | 3/18 | 10 - 13 | 18 | NA | 120,000 | N | | no | BSL |
| 75092 | Methylene Chloride | 5 | J | 5 | J | ug/kg | BDSB012 | 1/18 | 10 - 20 | 5 | NA | 8,900 | C | | no | BSL |
| 95476 | O-Xylene | 0.6 | J | 0.6 | J | ug/kg | BDSB097 | 1/10 | 10 - 12 | 0.6 | NA | 21,000 | N | | no | BSL |
| 108883 | Toluene | 0.3 | J | 3 | J | ug/kg | BDSB097 | 6/18 | 10 - 13 | 3 | NA | 52,000 | N | | no | BSL |
| 79016 | Trichloroethylene (TCE) | 0.7 | J | 0.7 | J | ug/kg | BDSB058 | 1/9 | 10 - 17 | 0.7 | NA | 2,800 | C | | no | BSL |
| 1330207 | Xylenes, Total | 0.6 | J | 3 | J | ug/kg | BDSB097 | 4/18 | 10 - 13 | 3 | NA | 21,000 | N | | no | BSL |
| 83329 | Acenaphthylene | 130 | J | 130 | J | ug/kg | BDSB182 | 1/24 | 340 - 4,250 | 130 | NA | 370,000 | N | | no | BSL |
| 120127 | Anthracene | 67 | J | 190 | J | ug/kg | BDSS02 | 5/24 | 350 - 4,250 | 190 | NA | 2,200,000 | N | | no | BSL |
| 56553 | Benzo(a)anthracene | 58 | J | 2,500 | J | ug/kg | BDSB009 | 12/24 | 350 - 4,300 | 2,500 | NA | 620 | C | | yes | ASL |
| 50328 | Benzo(a)pyrene | 55 | J | 3,000 | J | ug/kg | BDSB009 | 11/19 | 350 - 4,300 | 3,000 | NA | 62 | C | | yes | ASL |
| 205992 | Benzo(b)fluoranthene | 39 | J | 2,800 | J | ug/kg | BDSB009 | 14/24 | 350 - 4,300 | 2,800 | NA | 620 | C | | yes | ASL |
| | Benzo(ghi)Perylene | 43 | J | 2,100 | J | ug/kg | BDSB009 | 12/24 | 350 - 4,300 | 2,100 | NA | 2,300,000 | | | no | BSL |
| 207089 | Benzo(k)fluoranthene | 55 | J | 2,700 | J | ug/kg | BDSB009 | 10/19 | 350 - 4,300 | 2,700 | NA | 6,200 | C | | yes | CPAH |

* The Florida Soil Cleanup Target Level was used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
 Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:
 Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

Definitions:
 N/A = Not Applicable
 ND = Not Detected
 SQL = Sample Quantitation Limit
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food

TABLE (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Soil - Offsite
Exposure Medium: Surface Soil - Offsite
Exposure Point: Residences

| CAS Number | Chemical | Minimum (1) Concentration | Minimum Qualifier | Maximum (1) Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection frequency | Range of Detection Limits | Concentration Used for Screening | Background (2) Value | Screening (3) Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|----------------------------|------------------------------|----------------------|------------------------------|----------------------|-------|---|------------------------|---------------------------------|--|-------------------------|---------------------------------|--------------------------------|---------------------------------|--------------|--|
| 50328 | Benz(a)pyrene | 62 | J | 450 | | ug/kg | BDSS02 | 3/5 | 360 - 410 | 450 | NA | 62 | C | | yes | ASL |
| | Benzyl Butyl Phthalate | 54 | J | 54 | J | ug/kg | BDSB157 | 1/22 | 340 - 4,250 | 54 | NA | 1,200,000 | N | | no | BSL |
| 117817 | Bis(2-Ethylhexyl)Phthalate | 130 | J | 790 | | ug/kg | BDSB130 | 5/23 | 340 - 4,250 | 790 | NA | 35,000 | C | | no | BSL |
| 86748 | Carbazole | 25 | J | 79 | J | ug/kg | BDSB045 | 3/23 | 340 - 4,250 | 79 | NA | 24,000 | C | | no | BSL |
| 218019 | Chrysene | 49 | J | 2,800 | J | ug/kg | BDSB009 | 14/24 | 350 - 4,300 | 2,800 | NA | 62,000 | C | | no | BSL |
| 53703 | Dibenz(a,h)anthracene | 67 | J | 130 | J | ug/kg | BDSB058 | 3/23 | 350 - 4,250 | 130 | NA | 62 | C | | yes | ASL |
| 84742 | Di-n-butylphthalate | 40 | J | 40 | J | ug/kg | BDSB071 | 1/23 | 340 - 4,250 | 40 | NA | 360 | N | | no | BSL |
| 117840 | Di-n-octylphthalate | 130 | J | 130 | J | ug/kg | BDSB157 | 1/23 | 340 - 4,250 | 130 | NA | 120,000 | N | | no | BSL |
| 206440 | Fluoranthene | 41 | J | 5,600 | | ug/kg | BDSB009 | 14/24 | 350 - 4,300 | 5,600 | NA | 230,000 | N | | no | BSL |
| 193395 | Indeno (1,2,3-cd) pyrene | 90 | J | 1,800 | J | ug/kg | BDSB009 | 8/25 | 350 - 4,300 | 1,800 | NA | 620 | C | | yes | ASL |
| 85018 | Phenanthrene | 63 | J | 3,100 | J | ug/kg | BDSB009 | 10/24 | 350 - 4,300 | 3,100 | NA | 2,000,000 | N | | no | BSL |
| 129000 | Pyrene | 44 | J | 3,100 | J | ug/kg | BDSB009 | 14/24 | 350 - 4,300 | 3,100 | NA | 230,000 | N | | no | BSL |
| 309002 | Aldrin | 160 | | 160 | | ug/kg | BDSB012 | 1/26 | 1.8 - 1,050 | 160 | NA | 29 | C | | yes | ASL |
| 12789036 | Alpha Chlordane | 75 | | 200 | | ug/kg | BDSB088 | 2/15 | 1.8 - 1,050 | 200 | NA | 1600 | C | | yes | ASL |
| 12789036 | Alpha Chlordane 2 | 13 | | 13 | | ug/kg | BDSS11 | 1/8 | 1.9 - 50 | 13 | NA | 1600 | C | | yes | ASL |
| | Beta BHC | 0.81 | JN | 0.81 | JN | ug/kg | BDSS16 | 1/26 | 1.8 - 1,050 | 0.81 | NA | NA | | | no | TX |
| 60571 | Dieldrin | 4.4 | | 100 | J | ug/kg | BDSB088 | 4/27 | 3.5 - 2,100 | 100 | NA | 30 | C | | yes | ASL |
| 72208 | Endrin | 7.9 | NJ | 41 | J | ug/kg | BDSB182 | 2/24 | 3.5 - 2,100 | 41 | NA | 1,800 | N | | no | BSL |
| 72208 | Endrin Aldehyde | 0.87 | J | 0.87 | J | ug/kg | BDSS05 | 1/23 | 3.5 - 2,100 | 0.87 | NA | 1,800 | N | | no | BSL |

* The Florida Soil Cleanup Target Level was used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
 Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason: Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

Definitions: N/A = Not Applicable
 ND = Not Detected
 SQL = Sample Quantitation Limit
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food

TABLE B (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil - Offsite |
| Exposure Medium: | Surface Soil - Offsite |
| Exposure Point: | Residences |

| CAS Number | Chemical | Minimum (1) Concentration | Minimum Qualifier | Maximum (1) Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection frequency | Range of Detection Limits | Concentration Used for Screening | Background (2) Value | Screening (3) Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-------------------------|---------------------------|-------------------|---------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|----------------------|------------------------------|--------------------------|---------------------------|-----------|---|
| 12789036 | Gamma-Chlordane | 0.46 | J | 460 | | ug/kg | BDSB012 | 6/26 | 1.8 - 1,050 | 460 | NA | 1600 | C | | no | BSL |
| 76448 | Heptachlor | 0.44 | JN | 0.44 | JN | ug/kg | BDSS16 | 1/22 | 1.8 - 1,100 | 0.44 | NA | 110 | C | | no | BSL |
| 1024573 | Heptachlor Epoxide | 5.95 | J | 5.95 | J | ug/kg | BDSB182 | 1/22 | 1.8 - 1,050 | 5.95 | NA | 53 | C | | no | BSL |
| 72548 | p,p'-DDD | 2.7 | JN | 41 | C | ug/kg | BDSB182 | 4/25 | 3.5 - 2,100 | 41 | NA | 2400 | C | | no | BSL |
| 72559 | p,p'-DDE | 9.4 | | 380 | | ug/kg | BDSB012 | 7/26 | 3.5 - 2,100 | 380 | NA | 1700 | C | | no | BSL |
| 50293 | p,p'-DDT | 7.1 | N | 1,000 | | ug/kg | BDSB012 | 7/26 | 3.5 - 2,100 | 1,000 | NA | 1700 | C | | no | BSL |
| 11096825 | PCB-1260 (Aroclor 1260) | 6.6 | J | 800 | C | ug/kg | BDSB182 | 9/27 | 27 - 4,200 | 800 | NA | 220 | C | | yes | ASL |
| 7429905 | Aluminum | 580 | | 26,000 | | ug/kg | BDSB009 | 97/97 | | 26,000 | NA | 7,600 | N | | yes | ASL |
| 7440360 | Antimony | 0.52 | J | 60 | J | ug/kg | BDSB009 | 31/93 | 0.47 - 3.3 | 60 | NA | 3.1 | N | | yes | ASL |
| 7440382 | Arsenic | 0.47 | J | 21 | | ug/kg | BDSB097 | 81/94 | 0.44 - 2 | 21 | NA | 0.39 | C | | yes | ASL |
| 7440393 | Barium | 3.3 | J | 810 | J | ug/kg | BDSB012 | 92/92 | | 810 | NA | 110 * | N | | yes | ASL |
| 7440417 | Beryllium | 0.061 | J | 1 | I ? | ug/kg | BDSS03 | 53/95 | 0.053 - 1 | 1 | NA | 15 | N | | no | BSL |
| 7440439 | Cadmium | 0.11 | J | 8.8 | | ug/kg | BDSS11 | 87/93 | 0.082 - 0.1 | 8.8 | NA | 3.7 | N | | yes | ASL |
| | Calcium | 890 | J | 130,000 | | ug/kg | BDSB116 | 93/93 | | 130,000 | NA | NA | | | -- | |

* The Florida Soil Cleanup Target Level was used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)

Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason: Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

Definitions: N/A = Not Applicable
 ND = Not Detected
 SQL = Sample Quantitation Limit
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food

380136

TABLE B (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil - Offsite |
| Exposure Medium: | Surface Soil - Offsite |
| Exposure Point: | Residences |

| CAS Number | Chemical | Minimum (1) Concentration | Minimum Qualifier | Maximum (1) Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection frequency | Range of Detection Limits | Concentration Used for Screening | Background (2) Value | Screening (3) Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-----------|---------------------------|-------------------|---------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|----------------------|------------------------------|--------------------------|---------------------------|-----------|---|
| 7440484 | Chromium | 1.3 | J | 140 | J | ug/kg | BDSS13 | 93/93 | | 140 | NA | 23 | C | | yes | ASL |
| 7440508 | Cobalt | 0.24 | J | 11 | J | ug/kg | BDSB097 | 84/93 | 0.18 - 0.22 | 11 | NA | 470 | N | | no | BSL |
| 57125 | Copper | 1.6 | J | 460 | J | ug/kg | BDSB097 | 93/93 | | 460 | NA | 110 * | N | | yes | ASL |
| 7439896 | Cyanide | 0.06 | J | 2.4 | J | ug/kg | BDSB166 | 53/85 | 0.03 - 0.65 | 2.4 | NA | 30 * | N | | no | BSL |
| 7439896 | Iron | 260 | | 110,000 | | ug/kg | BDSB097 | 93/93 | | 110,000 | NA | 2,300 | N | | yes | ASL |
| 7439921 | Lead | 4.4 | | 22600 | | ug/kg | BDSB009 | 537/652 | | 22600 | NA | 400 | N | | yes | ASL |
| 7439965 | Magnesium | 67 | J | 6,490 | J | ug/kg | BDSB041 | 93/93 | | 6,490 | NA | NA | | | - | |
| 7439976 | Manganese | 4.00 | | 760 | | ug/kg | BDSB097 | 94/94 | | 760 | NA | 180 | N | | yes | ASL |
| 7440020 | Mercury | 0.004 | J | 15 | | ug/kg | BDSB054 | 83/85 | 0.027 - 0.003 | 15 | NA | 2.3 | N | | yes | ASL |
| 7440224 | Nickel | 0.52 | J | 54 | J | ug/kg | BDSB097 | 86/93 | 0.8 - 1.9 | 54 | NA | 110 * | N | | no | BSL |
| | Potassium | 21 | J | 2,400 | J | ug/kg | BDSB009 | 93/93 | | 2,400 | NA | NA | | | - | |
| | Silver | 0.2 | J | 5.1 | | ug/kg | BDSB097 | 26/95 | 0.17 - 1 | 5.1 | NA | 39 | N | | no | BSL |
| | Sodium | 34 | | 1,030 | J | ug/kg | BDSB009 | 19/94 | 46 - 270 | 1,030 | NA | NA | | | - | |

* The Florida Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
- (2) Background concentrations are not being used for this evaluation.
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk or a hazard quotient of 0.1
- (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC in the remedial goal option section, as appropriate.
- (5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)
- Carcinogenic PAHs evaluated as a group (CPAH)
- Deletion Reason:
- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)

Definitions:

N/A = Not Applicable

ND = Not Detected

SQL = Sample Quantitation Limit

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = Estimated Value

n = Presumptive evidence of material

C = Carcinogenic

N = Non-Carcinogenic

W = Water

NF = Nonfood

F = Food

380137

TABLE B (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil - Offsite |
| Exposure Medium: | Surface Soil - Offsite |
| Exposure Point: | Residences |

| CAS Number | Chemical | Minimum (1) Concentration | Minimum Qualifier | Maximum (1) Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection frequency | Range of Detection Limits | Concentration Used for Screening | Background (2) Value | Screening (3) Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|--------------------|---------------------------|-------------------|---------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|----------------------|------------------------------|--------------------------|---------------------------|-----------|---|
| 7439976 | Thallium | 0.38 | J | 0.38 | J | ug/kg | BDSB041 | 1/93 | 0.49 - 1 | 0.38 | NA | 5,500 N | | | no | BSL |
| 7440622 | Total Mercury | 0.12 | | 5.6 | | ug/kg | BDSS11 | 8/8 | | 5.6 | NA | 2.3 N | | | yes | ASL |
| 7440666 | Vanadium | 1.8 | J | 80.5 | | ug/kg | BDSB009 | 93/93 | | 80.5 | NA | 15 * N | | | yes | ASL |
| 7440666 | Zinc | 5.8 | | 5,100 | | ug/kg | BDSB101 | 93/93 | | 5,100 | NA | 2,300 N | | | yes | ASL |
| 1746016 | 2,3,7,8-TCDD (TEQ) | 27.7 | | 168.7 | | ng/kg | BDSB097 | | | 168.7 | NA | 3.9 C | | | yes | ASL |

* The Florida Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)

Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason: Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

Definitions: N/A = Not Applicable
 ND = Not Detected
 SQL = Sample Quantitation Limit
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food

380138

TABLE 2.2

| | |
|---------------------|---------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Yard Sample BDS8009 |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Contaminant Deletion or Selection (4) |
|------------|-------------------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|---|
| 7429905 | Aluminum | 26,000 | | 26,000 | | mg/kg | BDSB009 | 1/1 | NA | 26,000 | NA | 7600N | | | yes | ASL |
| 7439921 | Lead | 39,000 | | 39,000 | | ug/kg | BDSB009 | 1/1 | NA | 39,000 | NA | 400N | | | yes | ASL |
| 56553 | Benzo(a)anthracene | 2,500 | J | 2,500 | J | mg/kg | BDSB009 | 1/1 | NA | 2,500 | NA | 620C | | | yes | ASL, CPAH |
| 50328 | Benzo(a)pyrene | 3,000 | J | 3,000 | J | ug/kg | BDSB009 | 1/1 | NA | 3,000 | NA | 62C | | | yes | ASL, CPAH |
| 205992 | Benso(b)fluoranthene | 2,800 | J | 2,800 | J | ug/kg | BDSB009 | 1/1 | NA | 2,800 | NA | 620C | | | yes | ASL, CPAH |
| 103395 | Indeno(1,2,3-c,d)pyrene | 1,800 | J | 1,800 | J | ug/kg | BDSB009 | 1/1 | NA | 1,800 | NA | 620C | | | yes | ASL, CPAH |

- | | |
|-----|---|
| (1) | Minimum/maximum detected concentration. |
| (2) | Background concentrations are not being used for this evaluation. |
| (3) | Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1 |
| (4) | EPA Region IV does not use comparsons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate. |
| (5) | <p>Rationale Codes Selection Reason:</p> <p> Infrequent Detection but Associated Historically (HIST)</p> <p> Carcinogenic PAHs Evaluated as a Group (CPAH)</p> <p> Frequent Detection (FD)</p> <p> Toxicity Information Available (TX)</p> <p> Above Screening Levels (ASL)</p> <p> Carcinogenic PAHs evaluated as a group (CPAH)</p> <p> Deletion Reason:</p> <p> Infrequent Detection (IFD)</p> <p> Background Levels (BKG)</p> <p> No Toxicity Information (NTX)</p> <p> Essential Nutrient (NUT)</p> <p> Below Screening Level (BSL)</p> |

Definitions: N/A = Not Applicable
ND = Not Detected
NE = Not Established

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = Estimated Value

n = Presumptive evidence of material

C = Carcinogenic

N = Non-Carcinogenic

W = Water

NF \approx Nanfood

F = Food

TABLE 2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|---------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Yard Sample BDSB012 |

| CAS Number | Chemical | (1) Minimum Concentration | (1) Minimum Qualifier | (1) Maximum Concentration | (1) Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-----------------|------------------------------|--------------------------|------------------------------|--------------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 7440360 | Antimony | 13 | J | 13 | J | mg/kg | BDSB012 | 1/1 | NA | 13 | NA | 3.1N | | | yes | ASL |
| 7440382 | Arsenic | 2.6 | | 2.6 | | mg/kg | BDSB012 | 1/1 | NA | 2.6 | NA | 0.39C | | | yes | ASL |
| 7440393 | Barium | 810 | J | 810 | J | mg/kg | BDSB012 | 1/1 | NA | 810 | NA | 110N* | | | yes | ASL |
| 7440508 | Copper | 200 | J | 200 | J | mg/kg | BDSB012 | 1/1 | NA | 200 | NA | 110N* | | | yes | ASL |
| 18540299 | Chromium, Total | 66 | J | 66 | J | mg/kg | BDSB012 | 1/1 | NA | 66 | NA | 23C | | | yes | ASL |
| 7439896 | Iron | 12,000 | | 12,000 | | mg/kg | BDSB012 | 1/1 | NA | 12,000 | NA | 2300N | | | yes | ASL |
| 743992 | Lead | 1,300 | | 1,300 | | mg/kg | BDSB012 | 1/1 | NA | 1,300 | NA | 400N | | | yes | ASL |
| 7439965 | Manganese | 390 | J | 390 | J | mg/kg | BDSB012 | 1/1 | NA | 390 | NA | 180N | | | yes | ASL |
| 309002 | Aldrin | 160 | | 160 | | mg/kg | BDSB012 | 1/1 | NA | 160 | NA | 0.029C | | | yes | ASL |
| 50328 | Benzo(a)pyrene | 320 | J | 320 | J | ug/kg | BDSB012 | 1/1 | NA | 320 | NA | 62C | | | yes | ASL |
| 57749 | Chlordane | 460 | | 460 | | ug/kg | BDSB012 | 1/1 | NA | 460 | NA | 1,600 | | | no | BSL |

The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
- (2) Background concentrations are not being used for this evaluation.
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
- (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate
- (5) Rationale Codes Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
 - Carcinogenic PAHs Evaluated as a Group (CPAH)
 - Frequent Detection (FD)
 - Toxicity Information Available (TX)
 - Above Screening Levels (ASL)
 - Carcinogenic PAHs evaluated as a group (CPAH)
- Deletion Reason:
- Infrequent Detection (IFD)
 - Background Levels (BKG)
 - No Toxicity Information (NTX)
 - Essential Nutrient (NUT)
 - Below Screening Level (BSL)
 - Essential Nutrient (NUT)
 - Below Screening Level (BSL)

Definitions:

N/A = Not Applicable

ND = Not Detected

NE = Not Established

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = Estimated Value

n = Presumptive evidence of material

C = Carcinogenic

N = Non-Carcinogenic

W = Water

NF = Nonfood

F = Food

380140

TA. 2.4

| | |
|---------------------|---------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Yard Sample BDSB014 |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|----------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 7440382 | Arsenic | 3.4 | | 3.4 | | mg/kg | BDSB014 | 1/1 | NA | 3.4 | NA | 0.39C | | | yes | ASL |
| 50328 | Benzo(a)pyrene | 170 | J | 170 | J | ug/kg | BDSB014 | 1/1 | NA | 170 | NA | 62C | | | yes | ASL |
| 7439896 | Iron | 6,900 | | 6,900 | | mg/kg | BDSB014 | 1/1 | NA | 6900 | NA | 2300N | | | yes | ASL |
| 7439921 | Lead | 377 | | 377 | | ug/kg | BDSB014 | 1/1 | NA | 377 | NA | 400N | | | no | BSL |

- (1) Minimum/maximum detected concentration.
- (2) Background concentrations are not being used for this evaluation.
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1.
- (4) EPA Region IV does not use comparators to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
- (5)

| Rationale Codes | Selection | Reason |
|-----------------|-----------|---|
| | | Infrequent Detection but Associated Historically (HIST) |
| | | Carcinogenic PAHs Evaluated as a Group (CPAH) |
| | | Frequent Detection (FD) |
| | | Toxicity Information Available (TX) |
| | | Above Screening Levels (ASL) |
| | | Carcinogenic PAHs evaluated as a group (CPAH) |

Definitions:

N/A = Not Applicable

ND = Not Detected

NE = Not Established

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = Estimated Value

n = Presumptive evidence of material

C = Carcinogenic

N = Non-Carcinogenic

W = Water

NF = Nonfood

F = Food

Deletion Reason:

- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)

Essential Nutrient (NUT)

Below Screening Level (BSL)

TABLE 2.5
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|---------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Yard Sample BDSB039 |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-------------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 7440382 | Arsenic | 1.3 | | 1.3 | | mg/kg | BDSB039 | 1/1 | NA | 1.3 | NA | 0.39 C | | | YES | ASL |
| 7439896 | Iron | 110,000 | | 110,000 | | mg/kg | BDSB039 | 1/1 | NA | 110,000 | NA | 2,300 N | | | YES | ASL |
| 7439921 | Lead | 59 | | 59 | | ug/kg | BDSB039 | 1/1 | NA | 59 | NA | 400 N | | | YES | ASL |
| 50328 | Benzo(a)pyrene | 260 | J | 260 | J | ug/kg | BDSB039 | 1/1 | NA | 260 | NA | 62 C | | | YES | ASL, CPAH |
| 1746016 | 2,3,7,8-TCDD(TEQ) | 27.7 | | 27.7 | | ng/kg | BDSB039 | 1/1 | NA | 3.96 | NA | 3.9 C | | | YES | ASL |

- (1) Minimum/maximum detected concentration
- (2) Background concentrations are not being used for this evaluation.
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
- (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
- (5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Carcinogenic PAHs Evaluated as a Group (CPAH)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Carcinogenic PAHs evaluated as a group (CPAH)
- Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Essential Nutrient (NUT)
Below Screening Level (BSL)

Definitions:
N/A = Not Applicable
ND = Not Detected
NE = Not Established

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
n = Presumptive evidence of material
C = Carcinogenic
N = Non-Carcinogenic
W = Water
NF = Nonfood
F = Food

TABLE B.2.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|---------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Yard Sample BDSB045 |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|----------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 7440360 | Antimony | 19 | J | 19 | J | mg/kg | BDSB045 | 1/1 | NA | 1.9 | NA | 3.1N | | | yes | ASL |
| 7440382 | Arsenic | 4.1 | | 4.1 | | mg/kg | BDSB045 | 1/1 | NA | 4.1 | NA | 0.39C | | | yes | ASL |
| 7440393 | Barium | 500 | | 500 | | mg/kg | BDSB045 | 1/1 | NA | 500 | NA | 110N* | | | yes | ASL |
| 7440439 | Cadmium | 7.2 | | 7.2 | | mg/kg | BDSB045 | 1/1 | NA | 7.2 | NA | 3.7N | | | yes | ASL |
| 7440508 | Copper | 200 | | 200 | | mg/kg | BDSB045 | 1/1 | NA | 200 | NA | 110N* | | | yes | ASL |
| 7439896 | Iron | 9,100 | | 9,100 | | mg/kg | BDSB045 | 1/1 | NA | 9100 | NA | 2300N | | | yes | ASL |
| 7439921 | Lead | 2,100 | J | 2,100 | J | mg/kg | BDSB045 | 1/1 | NA | 2100 | NA | 400N | | | yes | ASL |
| 50328 | Benzo(a)pyrene | 440 | | 440 | | ug/kg | BDSB045 | 1/1 | NA | 440 | NA | 62C | | | yes | ASL |

The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
- (2) Background concentrations are not being used for this evaluation.
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
- (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
- (5) Rationale Codes Selection Reason
- Infrequent Detection but Associated Historically (HIST)
- Carcinogenic PAHs Evaluated as a Group (CPAH)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)
- Carcinogenic PAHs evaluated as a group (CPAH)
- Deletion Reason:
- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)

Definitions:

N/A = Not Applicable

ND = Not Detected

NE = Not Established

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = Estimated Value

n = Presumptive evidence of material

C = Carcinogenic

N = Non-Carcinogenic

W = Water

NF = Nonfood

F = Food

TABLE 7
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Yard Sample BDSB054

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-----------------|---------------------------------|----------------------|---------------------------------|----------------------|-------|---|------------------------|---------------------------------|--|----------------------------|------------------------------------|--------------------------------|---------------------------------|--------------|--|
| 7440360 | Antimony | 7.4 | J | 7.4 | J | mg/kg | BDSB054 | 1/1 | NA | 7.4 | NA | 3.1N | | | yes | ASL |
| 7440382 | Arsenic | 12 | | 12 | | mg/kg | BDSB054 | 1/1 | NA | 12 | NA | 0.39C | | | yes | ASL |
| 7440393 | Barium | 310 | | 310 | | mg/kg | BDSB054 | 1/1 | NA | 310 | NA | 110N* | | | yes | ASL |
| 7440439 | Cadmium | 4.3 | | 4.3 | | mg/kg | BDSB054 | 1/1 | NA | 4.3 | NA | 3.7N | | | yes | ASL |
| 7440508 | Copper | 150 | | 150 | | mg/kg | BDSB054 | 1/1 | NA | 150 | NA | 110N* | | | yes | ASL |
| 18540299 | Chromium, Total | 31 | | 31 | | mg/kg | BDSB054 | 1/1 | NA | 31 | NA | 23C | | | yes | ASL |
| 7439896 | Iron | 47,000 | | 47,000 | | mg/kg | BDSB054 | 1/1 | NA | 47,000 | NA | 2300N | | | yes | ASL |
| 7439921 | Lead | 630 | | 630 | | mg/kg | BDSB054 | 1/1 | NA | 630 | NA | 400N | | | yes | ASL |
| 7439965 | Manganese | 390 | | 390 | | mg/kg | BDSB054 | 1/1 | NA | 390 | NA | 180N | | | yes | ASL |
| 7439976 | Mercury | 15 | | 15 | | mg/kg | BDSB054 | 1/1 | NA | 15 | NA | 2.3N | | | yes | ASL |
| 7440622 | Vanadium | 16 | | 16 | | mg/kg | BDSB054 | 1/1 | NA | 16 | NA | 15N* | | | yes | ASL |

The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)

Carcinogenic PAHs Evaluated as a Group (CPAH)
 Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason: Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

Definitions: N/A = Not Applicable
 ND = Not Detected
 NE = Not Established

COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food

3
8
0144

TABLE 2.8
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|----------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Yard Sample BDSB097* |

| CAS Number | Chemical | (1) Minimum Concentration | (1) Minimum Qualifier | (1) Maximum Concentration | (1) Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|--------------------|---------------------------|-----------------------|---------------------------|-----------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|----------------------|------------------------------|--------------------------|---------------------------|-----------|---|
| 7440360 | Antimony | 22 | J | 22 | J | mg/kg | BDSB097 | 1/1 | NA | 2.2 | NA | 3.1N | | | no | BSL |
| 7440382 | Arsenic | 21 | | 21 | | mg/kg | BDSB097 | 1/1 | NA | 2.1 | NA | 0.39C | | | yes | ASL |
| 7440393 | Barium | 740 | | 740 | | mg/kg | BDSB097 | 1/1 | NA | 740 | NA | 110N* | | | yes | ASL |
| 7440439 | Cadmium | 8.7 | | 8.7 | | mg/kg | BDSB097 | 1/1 | NA | 8.7 | NA | 3.7N | | | yes | ASL |
| 7440508 | Copper | 460 | J | 460 | J | mg/kg | BDSB097 | 1/1 | NA | 460 | NA | 110N* | | | yes | ASL |
| 18540299 | Chromium, Total | 81 | | 81 | | mg/kg | BDSB097 | 1/1 | NA | 81 | NA | 23C | | | yes | ASL |
| 7439896 | Iron | 110,000 | | 110,000 | | mg/kg | BDSB097 | 1/1 | NA | 110,000 | NA | 2,300N | | | yes | ASL |
| 7439921 | Lead | 2,600 | | 2,600 | | mg/kg | BDSB097 | 1/1 | NA | 2,600 | NA | 400N | | | yes | ASL |
| 7439965 | Manganese | 760 | | 760 | | mg/kg | BDSB097 | 1/1 | NA | 760 | NA | 180N | | | yes | ASL |
| 50328 | Benzo(a)pyrene | 120 | J | 120 | J | ug/kg | BDSB097 | 1/1 | NA | 120 | NA | 62C | | | yes | ASL |
| 7440622 | Vanadium | 17 | | 17 | | ug/kg | BDSB097 | 1/1 | NA | 17 | NA | 15N* | | | yes | ASL |
| 1746016 | 2,3,7,8-TCDD (TEQ) | 168.7 | | 168.7 | | ng/kg | BDSB097 | 1/1 | NA | 0.406 | NA | 3.9C | | | yes | ASL |

* The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason:

Infrequent Detection but Associated Historically (HIST)
 Carcinogenic PAHs Evaluated as a Group (CPAH)
 Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:
 Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

Definitions:
 N/A = Not Applicable
 ND = Not Detected
 NE = Not Established

COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food

TABLE B.2.9
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

Scenario Timeframe Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Yard Sample BDSB101

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-----------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 7440360 | Antimony | 9.8 | J | 9.8 | J | mg/kg | BDSB101 | 1/1 | NA | 9.8 | NA | 3.1N | | | yes | ASL |
| 7440382 | Arsenic | 8 | | 8 | | mg/kg | BDSB101 | 1/1 | NA | 8 | NA | 0.39C | | | yes | ASL |
| 7440393 | Barium | 380 | | 380 | | mg/kg | BDSB101 | 1/1 | NA | 380 | NA | 110N* | | | yes | ASL |
| 7440439 | Cadmium | 6.5 | | 6.5 | | mg/kg | BDSB101 | 1/1 | NA | 6.5 | NA | 3.7N | | | yes | ASL |
| 7440508 | Copper | 320 | J | 320 | J | mg/kg | BDSB101 | 1/1 | NA | 320 | NA | 110N* | | | yes | ASL |
| 18540299 | Chromium, Total | 39 | | 39 | | mg/kg | BDSB101 | 1/1 | NA | 39 | NA | 23C | | | yes | ASL |
| 7439896 | Iron | 41,000 | | 41,000 | | mg/kg | BDSB101 | 1/1 | NA | 41,000 | NA | 2300N | | | yes | ASL |
| 7439921 | Lead | 860 | J | 860 | J | mg/kg | BDSB101 | 1/1 | NA | 860 | NA | 400N | | | yes | ASL |
| 7439965 | Manganese | 380 | | 380 | | mg/kg | BDSB101 | 1/1 | NA | 380 | NA | 180N | | | yes | ASL |
| 7440622 | Vanadium | 22 | | 22 | | mg/kg | BDSB101 | 1/1 | NA | 22 | NA | 15N* | | | yes | ASL |
| 7440666 | Zinc | 5,100 | | 5,100 | | mg/kg | BDSB101 | 1/1 | NA | 5100 | NA | 2300N | | | yes | ASL |

The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration
- (2) Background concentrations are not being used for this evaluation.
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
- (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
- (5) Rationale Codes: Selection: Reas: Infrequent Detection but Associated Historically (HIST)
- Carcinogenic PAHs Evaluated as a Group (CPAH)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)
- Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:

Infrequent Detection (IFD)

Background Levels (BKG)

No Toxicity Information (NTX)

Essential Nutrient (NUT)

Below Screening Level (BSL)

Essential Nutrient (NUT)

Below Screening Level (BSL)

Definitions:

N/A = Not Applicable

ND = Not Detected

NE = Not Established

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = Estimated Value

n = Presumptive evidence of material

C = Carcinogenic

N = Non-Carcinogenic

W = Water

NF = Nonfood

F = Food

380146

TABLE 2.10
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Yard Sample BDSB130

| CAS Number | Chemical | (1) Minimum Concentration | (1) Minimum Qualifier | (1) Maximum Concentration | (1) Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-----------------|------------------------------|--------------------------|------------------------------|--------------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 7429905 | Aluminum | 7,900 | J | 7,900 | J | mg/kg | BDSB130 | 1/1 | NA | 7900 | NA | 7600N | | | yes | ASL |
| 7440360 | Antimony | 3.4 | J | 3.4 | J | mg/kg | BDSB130 | 1/1 | NA | 3.4 | NA | 3.1N | | | yes | ASL |
| 7440382 | Arsenic | 3.5 | | 3.5 | | mg/kg | BDSB130 | 1/1 | NA | 3.5 | NA | 0.39C | | | yes | ASL |
| 7440393 | Barium | 340 | | 340 | | mg/kg | BDSB130 | 1/1 | NA | 340 | NA | 110N* | | | yes | ASL |
| 7440439 | Cadmium | 5.1 | | 5.1 | | mg/kg | BDSB130 | 1/1 | NA | 5.1 | NA | 3.7N | | | yes | ASL |
| 18540299 | Chromium, Total | 27 | | 27 | | mg/kg | BDSB130 | 1/1 | NA | 27 | NA | 23C | | | yes | ASL |
| 7439896 | Iron | 10,000 | | 10,000 | | mg/kg | BDSB130 | 1/1 | NA | 10,000 | NA | 2300N | | | yes | ASL |
| 7439921 | Lead | 340 | | 340 | | mg/kg | BDSB130 | 1/1 | NA | 340 | NA | 400 | | | no | BSL |

The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
(2) Background concentrations are not being used for this evaluation.
(3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
(4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
(5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)

Carcinogenic PAHs Evaluated as a Group (CPAH)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

Essential Nutrient (NUT)
Below Screening Level (BSL)

Definitions: N/A = Not Applicable
ND = Not Detected
NE = Not Established

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
n = Presumptive evidence of material
C = Carcinogenic
N = Non-Carcinogenic
W = Water
NF = Nonfood
F = Food

TABLE 2.11
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|---------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Yard Sample BDSB182 |

| CAS Number | Chemical | (1) Minimum Concentration | (1) Minimum Qualifier | (1) Maximum Concentration | (1) Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|---------------------------|------------------------------|--------------------------|------------------------------|--------------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 7440382 | Arsenic | 2.3 | J | 2.3 | J | mg/kg | BDSB182 | 1/1 | NA | 2.3 | NA | 0.39C | | | yes | ASL |
| 7440508 | Copper | 110 | | 110 | | mg/kg | BDSB182 | 1/1 | NA | 110 | NA | 110N* | | | yes | ASL |
| 7439896 | Iron | 5,550 | | 5,550 | | mg/kg | BDSB182 | 1/1 | NA | 5550 | NA | 2300N | | | yes | ASL |
| 7439921 | Lead | 310 | | 310 | | mg/kg | BDSB182 | 1/1 | NA | 158 | NA | 400N | | | yes | ASL |
| 50328 | Benzo(a)pyrene | 350 | | 350 | | ug/kg | BDSB182 | 1/1 | NA | 350 | NA | 62C | | | yes | ASL |
| 11096829 | PCB- 1260 (Arochlor 1260) | 260 | | 260 | | ug/kg | BDSB182 | 1/1 | NA | 260 | NA | 220C | | | yes | ASL |
| 1746016 | 2,3,7,8-TCDD(TEQ) | 39.6 | | 39.6 | | ng/kg | BDSB182 | 1/1 | NA | 0.5405 | NA | 3.9C | | | yes | ASL |

The Florida Soil Cleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
- (2) Background concentrations are not being used for this evaluation
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 residential values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
- (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
- (5) Rationale Codes Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
 - Carcinogenic PAHs Evaluated as a Group (CPAH)
 - Frequent Detection (FD)
 - Toxicity Information Available (TX)
 - Above Screening Levels (ASL)
 - Carcinogenic PAHs evaluated as a group (CPAH)
- Deletion Reason:
- Infrequent Detection (IFD)
 - Background Levels (BKG)
 - No Toxicity Information (NTX)
 - Essential Nutrient (NUT)
 - Below Screening Level (BSL)
 - Essential Nutrient (NUT)
 - Below Screening Level (BSL)

Definitions:

N/A = Not Applicable

ND = Not Detected

NE = Not Established

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = Estimated Value

n = Presumptive evidence of material

C = Carcinogenic

N = Non-Carcinogenic

W = Water

NF = Nonfood

F = Food

TABLE 12
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

Scenario Timeframe: Future
Medium: Groundwater - Offsite
Exposure Medium: Groundwater - Offsite
Exposure Point: Surficial Aquifer

| CAS Number | Chemical | Minimum (1) Concentration | Minimum Qualifier | Maximum (1) Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | Background (2) Value | Screening (3) Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|--------------------------|------------------------------|----------------------|------------------------------|----------------------|-------|---|------------------------|---------------------------------|--|-------------------------|---------------------------------|--------------------------------|---------------------------------|--------------|--|
| 309002 | Aldrin | 0.22 | J | 0.22 | J | ug/L | BDMW010 | 1/5 | 0.05 - 0.05 | 0.22 | NA | 0.004 | C | | yes | ASL |
| 72208 | Endrin | 0.02 | J | 0.02 | J | ug/L | BDMW010 | 1/9 | 0.1 - 0.1 | 0.02 | NA | 1.1 | N | | no | BSL |
| 12789036 | Chlordane | 0.5 | J | 0.5 | J | ug/L | BDMW010 | 1/5 | 0.05 - 0.05 | 0.5 | NA | 0.19 | C | | yes | ASL |
| 76448 | Heptachlor | 0.13 | | 0.13 | | ug/L | BDMW010 | 1/4 | 0.05 - 0.05 | 0.13 | NA | 0.015 | C | | yes | ASL |
| 1024573 | Heptachlor Epoxide | 0.39 | | 0.39 | | ug/L | BDMW010 | 1/4 | 0.05 - 0.05 | 0.39 | NA | 0.0074 | C | | yes | ASL |
| 72559 | p,p'-DDE | 0.2 | J | 0.2 | J | ug/L | BDMW010 | 1/6 | 0.1 - 0.1 | 0.2 | NA | 0.2 | C | | no | BSL |
| 50293 | p,p'-DDT | 0.33 | J | 0.33 | J | ug/L | BDMW010 | 1/6 | 0.1 - 0.1 | 0.33 | NA | 0.2 | C | | yes | ASL |
| 12674112 | PCB-1016 (Arochlor 1016) | 1.5 | | 1.5 | | ug/L | BDMW010 | 1/3 | 1 - 1 | 1.5 | NA | 0.096 | N | | yes | ASL |
| 7429905 | Aluminum | 180 | | 180 | | ug/L | BDMW04 | 1/8 | 27 - 55 | 180 | NA | 3,600 | N | | no | BSL |
| 7440382 | Arsenic | 3.6 | J | 3.6 | J | ug/L | BDMW009 | 1/8 | 3/2 - 4 | 3.6 | NA | 0.045 | C | | yes | ASL |
| 7440393 | Barium | 25 | J | 240 | | ug/L | BDMW011 | 8/8 | NA | 240 | NA | 260 | N | | no | BSL |
| 7440417 | Beryllium | 0.99 | J | 0.99 | J | ug/L | BDMW009 | 1/8 | .54 - 1 | 0.99 | NA | 7.3 | N | | no | BSL |
| | Calcium | 9,500 | | 140,000 | | ug/L | BDMW013 | 8/8 | NA | 140,000 | NA | NA | | | no | NUT |

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 tap water values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are p in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)

Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason: Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

Definitions: N/A = Not Applicable
 ND = Not Detected
 NE = Not Established
 SQL = Sample Quantitation Limit
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 NF = Nonfood

TABLE B (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|-----------------------|
| Scenario Timeframe: | Future |
| Medium: | Groundwater - Offsite |
| Exposure Medium: | Groundwater - Offsite |
| Exposure Point: | Surficial Aquifer |

| CAS Number | Chemical | Minimum (1) Concentration | Minimum Qualifier | Maximum (1) Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | Background (2) Value | Screening (3) Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-----------|------------------------------|----------------------|------------------------------|----------------------|-------|---|------------------------|---------------------------------|--|-------------------------|---------------------------------|--------------------------------|---------------------------------|--------------|--|
| 7440484 | Cobalt | 1.6 | J | 8 | J | ug/L | BDMW009 | 2/8 | 1.4 - 2 | 8 | NA | 220 | N | | no | BSL |
| 7440508 | Copper | 17 | | 17 | | ug/L | BDMW04 | 1/8 | 1.6 - 7.5 | 17 | NA | 140 | N | | no | BSL |
| 7439896 | Iron | 1,200 | | 28,000 | J | ug/L | BDMW04 | 7/8 | 27 - 27 | 28000 | NA | 150 | N | | yes | ASL |
| 7439921 | Lead | 2 | J | 29 | | ug/L | BDMW04 | 2/8 | 1.5 - 1.5 | 29 | NA | 15 | N | | yes | ASL |
| 7439954 | Magnesium | 5,200 | | 41,000 | | ug/L | BDMW013 | 8/8 | NA | 41000 | NA | NA | | | no | NUT |
| 7439965 | Manganese | 26 | | 330 | | ug/L | BDMW011, 013 | 8/8 | NA | 330 | NA | 88 | N | | yes | ASL |
| 7440020 | Nickel | 8.9 | J | 8.9 | J | ug/L | BDMW009 | 1/8 | 4 - 4.7 | 8.9 | NA | 73 | N | | no | BSL |
| | Potassium | 1,600 | J | 49,000 | | ug/L | BDMW008 | 8/8 | NA | 49000 | NA | NA | | | no | NUT |
| 7782492 | Selenium | 6.1 | | 6.1 | | ug/L | BDMW008 | 1/8 | 3 - 4.2 | 6.1 | NA | 18 | N | | no | BSL |
| | Sodium | 14,000 | | 39,000 | | ug/L | BDMW013 | 8/8 | NA | 39000 | NA | NA | | | no | NUT |
| 7440622 | Vanadium | 9.1 | J | 9.1 | J | ug/L | BDMW008 | 1/8 | 2 - 2.2 | 9.1 | NA | 26 | N | | no | BSL |
| 7440666 | Zinc | 6.1 | J | 110 | | ug/L | BDMW04 | 4/8 | 5.9 - 5.9 | 110 | NA | 1,100 | N | | no | BSL |

- (1) Minimum/maximum detected concentration.
- (2) Background concentrations are not being used for this evaluation.
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 tap water values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
- (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are p in the remedial goal option section, as appropriate.
- (5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

Definitions: N/A = Not Applicable
ND = Not Detected
NE = Not Established
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
n = Presumptive evidence of material
C = Carcinogenic
N = Non-Carcinogenic
NF = Nonfood

TABLE 13
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Well Sample BDMW04

| CAS Number | Chemical | (1) Minimum Concentration | (1) Minimum Qualifier | (1) Maximum Concentration | (1) Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|-----------|------------------------------|--------------------------|------------------------------|--------------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 7439896 | Iron | 28,000 | | 28,000 | | ug/L | BDMW04 | 1/1 | NA | 28,000 | NA | 150 N | | | YES | ASL |
| 7439921 | Lead | 29 | | 29 | | ug/L | BDMW04 | 1/1 | NA | 29 | NA | 15 | | | YES | ASL |
| 7439965 | Manganese | 150 | | 150 | | ug/L | BDMW04 | 1/1 | NA | 150 | NA | 88 N | | | YES | ASL |

(1) Minimum/maximum detected concentration.

(2) Background concentrations are not being used for this evaluation.

(3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 tap water values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1.

(4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.

(5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
Carcinogenic PAHs Evaluated as a Group (CPAH)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

Essential Nutrient (NUT)
Below Screening Level (BSL)

Definitions:

N/A = Not Applicable

ND = Not Detected

NE = Not Established

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J = Estimated Value

n = Presumptive evidence of material

C = Carcinogenic

N = Non-Carcinogenic

W = Water

NF = Nonfood

F = Food

TABLE 2.14
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|---------------------|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Groundwater |
| Exposure Point: | Well Sample BDMW009 |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|----------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 7440382 | Arsenic | 3.6 | J | 3.6 | J | ug/L | BDMW009 | 1/1 | NA | 3.6 | NA | 0.045C | | | yes | ASL |
| 7439896 | Iron | 1,900 | | 1,900 | | ug/L | BDMW009 | 1/1 | NA | 1,900 | NA | 150N | | | yes | ASL |

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 tap water values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1.
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.

- (5) Rationale Codes Selection Reason:
 Infrequent Detection but Associated Historically (HIST)
 Carcinogenic PAHs Evaluated as a Group (CPAH)
 Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:
 Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

Definitions:
 N/A = Not Applicable
 ND = Not Detected
 NE = Not Established
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food

38 0152

TABLE 2.15
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|----------------------------------|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Groundwater |
| Exposure Point: | Monitoring Well Location BDMW010 |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | (1) Maximum Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | (2) Background Value | (3) Screening Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|--------------------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|--------------------------|---------------------------|-----------|--|
| 309002 | Aldrin | 0.22 | J | 0.22 | J | ug/L | BDMW010 | 1/1 | NA | 0.22 | NA | 0.004C | | | yes | ASL |
| 57749 | Chlordane | 0.5 | J | 0.5 | J | ug/L | BDMW010 | 1/1 | NA | 0.5 | NA | 0.19N | | | yes | ASL |
| 76448 | Heptachlor | 0.13 | | 0.13 | | ug/L | BDMW010 | 1/1 | NA | 0.13 | NA | 0.015C | | | yes | ASL |
| 1024573 | Heptachlor Epoxide | 0.39 | | 0.39 | | ug/L | BDMW010 | 1/1 | NA | 0.39 | NA | 0.0074C | | | yes | ASL |
| 7439896 | Iron | 2,800 | | 2,800 | | ug/L | BDMW010 | 1/1 | NA | 2000 | NA | 150N | | | yes | ASL |
| 7439965 | Manganese | 40 | | 40 | | ug/L | BDMW010 | 1/1 | NA | 40 | NA | 88N | | | no | BSL |
| 12674112 | PCB-1016 (Arochlor 1016) | 1.5 | | 1.5 | | ug/L | BDMW010 | 1/1 | NA | 1.5 | NA | 0.26N | | | yes | ASL |
| 72559 | p,p'-DDE | 0.2 | J | 0.2 | J | ug/L | BDMW010 | 1/1 | NA | 0.2 | NA | 0.2 | | | no | BSL |
| 50293 | p,p'-DDT | 0.33 | J | 0.33 | J | ug/L | BDMW010 | 1/1 | NA | 0.33 | NA | 0.2 | | | yes | ASL |

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 tap water values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason:

Infrequent Detection but Associated Historically (HIST)
 Carcinogenic PAHs Evaluated as a Group (CPAH)
 Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:
 Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

Essential Nutrient (NUT)
 Below Screening Level (BSL)

Definitions:
 N/A = Not Applicable
 ND = Not Detected
 NE = Not Established
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food

TABLE 16
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|---------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Subsurface Soil - Offsite |
| Exposure Medium: | Subsurface Soil - Offsite |
| Exposure Point: | Residences |

| CAS Number | Chemical | Minimum (1) Concentration | Minimum Qualifier | Maximum (1) Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | Background (2) Value | Screening (3) Toxicity Value | | | COPC Flag | Rationale for (4) Contaminant Deletion or Selection |
|------------|---------------------------------|---------------------------|-------------------|---------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|----------------------|------------------------------|--|--|-----------|---|
| 67641 | Acetone | 18 | | 540 | | ug/kg | BDSB127 | 8/11 | 11 - 19.5 | 540 | NA | 160,000 N | | | no | BSL |
| 71432 | Benzene | 0.7 | J | 21 | | ug/kg | BDSB130 | 9/11 | 12 - 13 | 21 | NA | 670 C | | | no | BSL |
| 75150 | Carbon Disulfide | 0.8 | J | 12 | | ug/kg | BDSB014 | 5/11 | 0.8 - 13 | 12 | NA | 36,000 N | | | no | BSL |
| 75003 | Chloroethane | 2 | J | 2 | J | ug/kg | BDSB127 | 1/11 | 10 - 15 | 2 | NA | 3,000 C | | | no | BSL |
| 74873 | Chloromethane | 1 | J | 1 | J | ug/kg | BDSB134 | 2/12 | 10 - 13 | 1 | NA | 1,200 C | | | no | BSL |
| 100414 | Ethylbenzene | 0.3 | J | 0.8 | J | ug/kg | BDSB097 | 7/11 | 10 - 15 | 0.8 | NA | 150,000 N | | | no | BSL |
| 98828 | Isopropylbenzene (Cumene) | 4 | J | 4 | J | ug/kg | BDSB127 | 1/11 | 10 - 15 | 4 | NA | 16,000 N | | | no | BSL |
| 1330207 | M,P-Xylene | 0.5 | J | 3 | J | ug/kg | BDSB097 | 5/11 | 10 - 15 | 3 | NA | 21,000(6) N | | | no | BSL |
| 78933 | Methyl Ethyl Ketone (2-Butanol) | 3 | J | 32 | | ug/kg | BDSB127 | 4/12 | 10 - 15 | 32 | NA | 730,000 N | | | no | BSL |
| 75092 | Methylene Chloride | 4 | J | 4 | J | ug/kg | BDSB012 | 1/11 | 10 - 15 | 4 | NA | 8,900 C | | | no | BSL |
| 95476 | O-Xylene | 0.3 | J | 1 | J | ug/kg | BDSB127 | 4/12 | 10 - 15 | 1 | NA | 21,000(6) N | | | no | BSL |
| 108883 | Toluene | 0.8 | J | 6 | J | ug/kg | BDSB127 | 9/11 | 10 - 12 | 6 | NA | 59,000 N | | | no | BSL |
| 79016 | Trichloroethylene (TCE) | 2 | J | 2 | J | ug/kg | BDSB058 | 1/11 | 10 - 15 | 2 | NA | 2,800 C | | | no | BSL |
| 1330207 | Xylenes, Total | 1.4 | J | 3 | J | ug/kg | BDSB127 | 4/11 | 10 - 15 | 3 | NA | 21,000 N | | | no | BSL |
| 83329 | Acenaphthene | 120 | J | 120 | J | ug/kg | BDSB058 | 1/12 | 370 - 3,800 | 120 | NA | 370,000 N | | | no | BSL |
| 83329 | Acenaphthylene | 140 | J | 330 | J | ug/kg | BDSB058 | 3/11 | 370 - 3,800 | 330 | NA | 370,000 N | | | no | BSL |

- (1) Minimum/maximum detected concentration.
(2) Background concentrations are not being used for this evaluation.
(3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 tap water values equal to a carcinogenic risk of 10⁻⁶ or a hazard quotient of 0.1
(4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are present in the remedial goal option section, as appropriate.
(5) Rationale Codes Selection Reason:

Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

(6) Screening value for total xylene used.

Definitions:
N/A = Not Applicable
ND = Not Detected
SQL = Sample Quantitation Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
n = Presumptive evidence of material
C = Carcinogenic
N = Non-Carcinogenic
W = Water
NF = Nonfood
F = Food

TABLE B. (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
BROWN'S DUMP SITE

| | |
|---------------------|---------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Subsurface Soil - Offsite |
| Exposure Medium: | Subsurface Soil - Offsite |
| Exposure Point: | Residences |

| CAS Number | Chemical | Minimum (1) Concentration | Minimum Qualifier | Maximum (1) Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | Background (2) Value | Screening (3) Toxicity Value | | | COPC Flag | Rationale for Contaminant Deletion or Selection (4) |
|------------|----------------------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|---|--|-----------|---|
| 120127 | Anthracene | 80 | J | 660 | | ug/kg | BDSB058 | 4/14 | 370 - 3,800 | 660 | NA | 2,200,000 | N | | no | BSL |
| 56553 | Benzo(a)anthracene | 120 | J | 2,000 | | ug/kg | BDSB058 | 5/12 | 370 - 540 | 2,000 | NA | 620 | C | | yes | ASL |
| 50328 | Benzo(a)pyrene | 190 | J | 2,250 | J | ug/kg | BDSB012 | 5/12 | 370 - 540 | 2,250 | NA | 62 | C | | yes | ASL |
| 205992 | Benzo(b)fluoranthene | 140 | J | 4,000 | | ug/kg | BDSB012 | 5/12 | 370 - 540 | 4,000 | NA | 620 | C | | yes | ASL |
| | Benzo(ghi)Perylene | 120 | J | 3,050 | J | ug/kg | BDSB012 | 5/12 | 370 - 540 | 3,050 | NA | 2,300,000 | | | no | BSL |
| 207089 | Benzo(k)fluoranthene | 160 | J | 2,150 | J | ug/kg | BDSB012 | 4/12 | 370 - 540 | 2,150 | NA | 6,200 | C | | no | BSL |
| 117817 | Bis(2-Ethylhexyl)Phthalate | 120 | J | 120 | J | ug/kg | BDSB097 | 1/12 | 350 - 3,800 | 120 | NA | 35,000 | C | | no | BSL |
| 86748 | Carbazole | 320 | J | 320 | J | ug/kg | BDSB058 | 1/12 | 370 - 3,800 | 320 | NA | 24,000 | C | | no | BSL |
| 218019 | Chrysene | 160 | J | 2,600 | J | ug/kg | BDSB012 | 5/13 | 370 - 540 | 2,600 | NA | 62,000 | C | | no | BSL |
| 53703 | Dibenz(a,h)anthracene | 230 | J | 420 | | ug/kg | BDSB058 | 2/12 | 370 - 3,800 | 420 | NA | 62 | C | | yes | ASL |
| 132649 | Dibenzofuran | 95 | J | 95 | J | ug/kg | BDSB058 | 1/12 | 370 - 3,800 | 95 | NA | 29,000 | N | | no | BSL |
| 206440 | Fluoranthene | 130 | J | 4,900 | | ug/kg | BDSB058 | 6/13 | 370 - 540 | 4,900 | NA | 230,000 | N | | no | BSL |
| 86737 | Fluorene | 110 | J | 110 | J | ug/kg | BDSB058 | 1/12 | 370 - 540 | 110 | NA | 260,000 | N | | no | BSL |
| 193395 | Indeno (1,2,3-cd) pyrene | 100 | J | 1,650 | J | ug/kg | BDSB012 | 4/12 | 350 - 540 | 1,650 | NA | 620 | C | | yes | ASL |
| 91203 | Naphthalene | 410 | | 410 | | ug/kg | BDSB127 | 1/12 | 350 - 540 | 410 | NA | 5,600 | N | | no | BSL |
| 85018 | Phenanthrene | 120 | J | 2,500 | | ug/kg | BDSB058 | 5/12 | 370 - 540 | 2,500 | NA | 2,000,000 | N | | no | BSL |

- (1) Minimum/maximum detected concentration.
- (2) Background concentrations are not being used for this evaluation.
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 tap water values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
- (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are present in the remedial goal option section, as appropriate.
- (5) Rationale Codes Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
 - Frequent Detection (FD)
 - Toxicity Information Available (TX)
 - Above Screening Levels (ASL)
 - Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason:

- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)

(6) Screening value for total xylene used.

Definitions:

- N/A = Not Applicable
- ND = Not Detected
- SQL = Sample Quantitation Limit
- COPC = Chemical of Potential Concern
- ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
- J = Estimated Value
- n = Presumptive evidence of material
- C = Carcinogenic
- N = Non-Carcinogenic
- W = Water
- NF = Nonfood
- F = Food

380155

TABLE B.2 (continued)
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 BROWN'S DUMP SITE

| | |
|---------------------|---------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Subsurface Soil - Offsite |
| Exposure Medium: | Subsurface Soil - Offsite |
| Exposure Point: | Residences |

| CAS Number | Chemical | (1) Minimum Concentration | Minimum Qualifier | Maximum (1) Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | Background (2) Value | (3) Screening Toxicity Value | | | COPC Flag | Rationale for Contaminant Deletion or Selection (4) |
|------------|-------------------------|------------------------------|-------------------|------------------------------|-------------------|-------|-----------------------------------|---------------------|---------------------------|----------------------------------|-------------------------|---------------------------------|---|--|-----------|---|
| 129000 | Pyrene | 94 | J | 2,900 | | ug/kg | BDSB058 | 6/13 | 370 - 540 | 2,900 | NA | 230,000 | N | | no | BSL |
| 72559 | p,p'-DDE | 12 | J | 41 | J | ug/kg | BDSB134 | 3/10 | 42 - 1,900 | 41 | NA | 1,700 | C | | no | BSL |
| 50293 | p,p'-DDT | 13 | J | 270 | J | ug/kg | BDSB045 | 3/11 | 3.5 - 1,900 | 270 | NA | 1,700 | C | | no | BSL |
| 11096825 | PCB-1260 (Aroclor 1260) | 20 | | 47 | | ug/kg | BDSB127 | 5/8 | 35 - 42 | 47 | NA | 220 | C | | no | BSL |
| 7429905 | Aluminum | 790 | | 13,000 | | mg/kg | BDSB009 | 24/24 | NA | 13,000 | NA | 7,600 | N | | yes | ASL |
| 7440360 | Antimony | 1.2 | J | 225 | J | mg/kg | BDSB045 | 22/24 | 0.57 - 1.3 | 225 | NA | 3.1 | N | | yes | ASL |
| 7440382 | Arsenic | 0.8 | J | 68 | | mg/kg | BDSB009 | 23/24 | 0.51 - 0.51 | 68 | NA | 0.39 | C | | yes | ASL |
| 740393 | Barium | 10.8 | J | 3,450 | | mg/kg | BDSB045 | 24/24 | NA | 3,450 | NA | 110 * | N | | yes | ASL |
| 7440417 | Beryllium | 0.06 | J | 0.47 | J | mg/kg | BDSB012 | 24/24 | NA | 0.47 | NA | 15 | N | | no | BSL |
| 740439 | Cadmium | 1.2 | | 50.5 | | mg/kg | BDSB045 | 22/24 | 0.099 - 0.15 | 50.5 | NA | 3.7 | N | | yes | ASL |
| | Calcium | 269 | J | 37,500 | | mg/kg | BDSB012 | 24/24 | NA | 37,500 | NA | NA | | | - | - |
| 18540299 | Chromium | 1.7 | J | 170 | J | mg/kg | BDSB007 | 24/24 | NA | 170 | NA | 23 | C | | yes | ASL |
| 7440484 | Cobalt | 1.5 | J | 26 | | mg/kg | BDSB135 | 22/24 | 0.22 - 0.42 | 26 | NA | 470 | N | | no | BSL |
| 7440508 | Copper | 0.64 | J | 5,300 | J | mg/kg | BDSB003 | 23/24 | 2.2 - 2.2 | 5,300 | NA | 110 * | N | | yes | ASL |
| 57125 | Cyanide | 0.31 | J | 7.9 | | mg/kg | BDSB093 | 17/21 | 0.53 - 0.62 | 7.9 | NA | 30 | N | | no | BSL |
| 7439896 | Iron | 1,200 | | 270,000 | | mg/kg | BDSB007 | 24/24 | NA | 270,000 | NA | 2,300 | N | | yes | ASL |
| 7439921 | Lead | 7.2 | | 30,000 | | mg/kg | BDSB045 | 177/213 | NA | 30,000 | NA | 400 | N | | yes | ASL |

* The Florida SoilCleanup Target Level (SCTL) was used.

- (1) Minimum/maximum detected concentration.
 (2) Background concentrations are not being used for this evaluation.
 (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 tap water values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
 (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are present in the remedial goal option section, as appropriate.
 (5) Rationale Codes Selection Reason: Infrequent Detection but Associated Historically (HIST)
 Frequent Detection (FD)
 Toxicity Information Available (TX)
 Above Screening Levels (ASL)
 Carcinogenic PAHs evaluated as a group (CPAH)

Deletion Reason: Infrequent Detection (IFD)
 Background Levels (BKG)
 No Toxicity Information (NTX)
 Essential Nutrient (NUT)
 Below Screening Level (BSL)

(6) Screening value for total xylene used.

Definitions: N/A = Not Applicable
 ND = Not Detected
 SQL = Sample Quantitation Limit
 COPC = Chemical of Potential Concern
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
 J = Estimated Value
 n = Presumptive evidence of material
 C = Carcinogenic
 N = Non-Carcinogenic
 W = Water
 NF = Nonfood
 F = Food

TABLE 6

| | |
|---------------------|---------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Subsurface Soil - Offsite |
| Exposure Medium: | Subsurface Soil - Offsite |
| Exposure Point: | Residences |

| CAS Number | Chemical | Minimum ⁽¹⁾ Concentration | Minimum Qualifier | Maximum ⁽¹⁾ Concentration | Maximum Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening | Background ⁽²⁾ Value | Screening ⁽³⁾ Toxicity Value | | | COPC Flag | Rationale for ⁽⁴⁾ Contaminant Deletion or Selection |
|------------|-----------|---|----------------------|---|----------------------|-------|---|------------------------|---------------------------------|--|------------------------------------|--|--|--|--------------|---|
| 7439954 | Magnesium | 48.7 | J | 4,400 | | mg/kg | BDSB009 | 24/24 | NA | 4,400 | NA | NA | | | -- | |
| 7439965 | Manganese | 5.4 | | 1,500 | J | mg/kg | BDSB007 | 24/24 | NA | 1,500 | NA | 180 N | | | yes | ASL |
| 7439976 | Mercury | 0.012 | J | 16.05 | J | mg/kg | BDSB007 | 23/23 | NA | 16.05 | NA | 2.3 N | | | yes | ASL |
| 7440020 | Nickel | 6.3 | J | 190 | | mg/kg | BDSB014 | 22/24 | 0.49 - 0.79 | 190 | NA | 110 N | | | yes | ASL |
| | Potassium | 47 | J | 1,700 | J | mg/kg | BDSB009 | 23/24 | 107 - 107 | 1,700 | NA | NA | | | -- | |
| 7440224 | Silver | 0.69 | J | 8.0 | J | mg/kg | BDSB045 | 22/24 | 0.22 - 0.32 | 8.0 | NA | 39 N | | | no | BSL |
| | Sodium | 19.2 | J | 1,500 | J | mg/kg | BDSB009 | 17/24 | 47 - 160 | 1,500 | NA | NA | | | -- | |
| | Thallium | 0.66 | J | 0.66 | J | mg/kg | BDSB128 | 1/24 | 0.05 - 3.10 | 0.66 | NA | 5,500 N | | | no | BSL |
| 7440622 | Vanadium | 2.5 | J | 640 | | mg/kg | BDSB014 | 25/25 | NA | 640 | NA | 15 N | | | yes | ASL |
| 7440666 | Zinc | 3.8 | J | 9,200 | | mg/kg | BDSB007 | 26/26 | NA | 9,200 | NA | 2,300 N | | | yes | ASL |

- (1) Minimum/maximum detected concentration.
- (2) Background concentrations are not being used for this evaluation.
- (3) Region 9 Preliminary Remediation Goals (PRGs) November 2000 tap water values equal to a carcinogenic risk of 10-6 or a hazard quotient of 0.1
- (4) EPA Region IV does not use comparisons to ARAR/TBC value to screen COPCs. However, potential ARAR/TBC values are presented in the remedial goal option section, as appropriate.
- (5) Rationale Codes Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)
- Carcinogenic PAHs evaluated as a group (CPAH)
- Deletion Reason:
- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)

(6) Screening value for total xylene used.

Definitions:

- N/A = Not Applicable**
- ND = Not Detected**
- SQL = Sample Quantitation Limit**
- COPC = Chemical of Potential Concern**
- ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered**
- J = Estimated Value**
- n = Presumptive evidence of material**
- C = Carcinogenic**
- N = Non-Carcinogenic**
- W = Water**
- NF = Nonfood**
- F = Food**

TABLE B.9.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|---------------------|---|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB009 | CPAHs | 2.8E-005 | | 1.1E-005 | 3.9E-005 | CPAHs | Unknown | - | | - | - |
| | | | Aluminum | - | | - | - | Aluminum | Unknown | 3.4E-001 | | 3.4E-002 | 3.7E-001 |
| | | | Lead | - | | - | - | Lead | Unknown | - | | - | - |
| | | | (Total) | 2.8E-005 | | 1.1E-005 | 3.9E-005 | (Total) | | 3.4E-001 | | 3.4E-002 | 3.7E-001 |
| | | | Total Risk Across All Media and All Exposure Routes | | | | 4E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | 4E-001 |

Total Unknown HI = 0.4

TABLE B.9.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|---------------------|---|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB009 | CPAHs | 1.4E-005 | | 1.4E-005 | 2.8E-005 | | | | | | |
| | | | Aluminum | - | | - | - | | | | | | |
| | | | Lead | - | | - | - | | | | | | |
| | | | (Total) | 1.4E-005 | | 1.4E-005 | 2.8E-005 | (Total) | | | | | |
| | | | Total Risk Across All Media and All Exposure Routes | | | | 3E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.9.3
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|---------------------|---|-------------------|------------|----------|-----------------------|-----------------|----------------------------------|---|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB012 | Aldrin | 3.0E-006 | | 1.1E-006 | 4.1E-006 | Aldrin | Liver | 6.9E-002 | | 2.8E-002 | 9.7E-002 |
| | | | Gamma-Chlordane | 1.8E-007 | | 6.8E-008 | 2.5E-007 | Gamma-Chlordane | Unknown | 1.2E-002 | | 7.5E-005 | 1.2E-002 |
| | | | CPAHs | 2.6E-006 | | 1.0E-006 | 3.6E-006 | CPAHs | Unknown | -- | | -- | -- |
| | | | Antimony | -- | | -- | -- | Antimony | Blood | 4.2E-001 | | 4.2E-002 | 4.6E-001 |
| | | | Arsenic | 4.3E-006 | | 8.7E-008 | 4.4E-006 | Arsenic | Skin | 1.1E-001 | | 2.3E-003 | 1.1E-001 |
| | | | Barium | -- | | -- | -- | Barium | CVS | 1.5E-001 | | 1.5E-002 | 1.7E-001 |
| | | | Chromium, Total | -- | | -- | -- | Chromium, Total | Skin | 2.9E-001 | | 2.9E-002 | 3.2E-001 |
| | | | Copper | -- | | -- | -- | Copper | Skin | 6.5E-002 | | 6.5E-003 | 7.2E-002 |
| | | | Iron | -- | | -- | -- | Iron | Unknown | 5.2E-001 | | 5.2E-002 | 5.7E-001 |
| | | | Lead | -- | | -- | -- | Lead | Unknown | -- | | -- | -- |
| | | | Manganese | -- | | -- | -- | Manganese | CNS | 7.2E-002 | | 7.2E-03 | 8.0E-002 |
| | | | (Total) | 1.0E-005 | | 2.3E-006 | 1.2E-005 | (Total) | | 1.7E+000 | | 1.7E-001 | 1.9E+000 |
| | | | Total Risk Across All Media and All Exposure Routes | | | | | | 1E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | |

| | |
|--------------------|-------|
| Total Blood HI = | 0.5 |
| Total Skin HI = | 0.5 |
| Total CVS HI = | 0.2 |
| Total CNS HI = | 0.08 |
| Total Liver HI = | 0.097 |
| Total Unknown HI = | 0.6 |

TABLE B.9.4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|-----------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB012 | Aldrin | 1.5E-006 | | 1.5E-006 | 3.0E-006 | | | | | | |
| | | | Gamma-Chlordane | 9.0E-008 | | 8.7E-008 | 1.8E-007 | | | | | | |
| | | | CPAHs | 1.3E-006 | | 1.3E-006 | 2.6E-006 | | | | | | |
| | | | Antimony | - | | - | - | | | | | | |
| | | | Arsenic | 2.2E-006 | | 1.1E-007 | 2.3E-006 | | | | | | |
| | | | Barium | - | | - | - | | | | | | |
| | | | Chromium, Total | - | | - | - | | | | | | |
| | | | Copper | - | | - | - | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Lead | - | | - | - | | | | | | |
| | | | Manganese | - | | - | - | | | | | | |
| | | | (Total) | 5.1E-006 | | 3.0E-006 | 8.1E-006 | (Total) | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 8E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.9.5
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|-----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB014 | Arsenic | 5.6E-006 | | 1.1E-007 | 5.7E-006 | Arsenic | Skin | 1.5E-001 | | 3.00E-003 | 1.5E-001 |
| | | | Iron | — | | — | — | Iron | Unknown | 3.0E-001 | | 3.0E-002 | 3.3E-001 |
| | | | Lead | — | | — | — | Lead | Unknown | — | | — | — |
| | | | CPAHs | 1.4E-006 | | 5.4E-007 | 1.9E-006 | CPAHs | Unknown | — | | — | — |
| | | | (Total) | 5.6E-006 | | 1.1E-007 | 7.6E-006 | (Total) | | 4.5E-001 | | 3.3E-002 | 4.8E-001 |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 8E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | 5E-001 |

Total Skin HI = 0.2
 Total Unknown HI = 0.3

TABLE B.9.6
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB014 | Arsenic | 2.9E-006 | | 1.5E-007 | 3.1E-006 | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Lead | - | | - | - | | | | | | |
| | | | CPAHs | 6.9E-007 | | 6.9E-007 | 1.4E-006 | | | | | | |
| | | | (Total) | 2.9E-006 | | 1.5E-007 | 4.4E-006 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 4E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.9.7
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|--------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB039 | Arsenic | 2.1E-006 | | 4.4E-006 | 2.1E-006 | Arsenic | Skin | 5.6E-002 | | 1.2E-003 | 5.7E-002 |
| | | | Iron | — | | — | — | Iron | Unknown | 1.1E-001 | | 1.1E-2 | 1.1E-001 |
| | | | Lead | — | | — | — | Lead | Unknown | — | | — | — |
| | | | CPAHs | 1.4E-006 | | 5.4E-007 | 1.9E-006 | CPAHs | Unknown | — | | — | — |
| | | | 2,3,7,8-TCDD (TEQ) | 4.6E-006 | | 1.7E-006 | 6.3E-006 | 2,3,7,8-TCDD (TEQ) | Unknown | — | | — | — |
| | | | | | | | | | | | | | |
| | | | (Total) | 8.1E-006 | | 2.3E-006 | 1.0E-005 | (Total) | | 1.7E-001 | | 1.2E-003 | 1.7E-001 |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 1E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | 2E-001 |

Total Skin HI = 0.06
 Total Unknown HI = 0.1

TABLE B.9.8
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|---------------------|---|-------------------|------------|----------|-----------------------|----------|----------------------------------|-----------|---|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB039 | Arsenic | 1.1E-006 | | 5.6E-008 | 1.2E-006 | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Lead | - | | - | - | | | | | | |
| | | | CPAHs | 6.9E-007 | | 6.9E-007 | 1.4E-006 | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) | 2.3E-006 | | 2.2E-006 | 4.5E-006 | | | | | | |
| | | | (Total) | 4.1E-006 | | 2.9E-006 | 7.0E-006 | | | | | | |
| | | | Total Risk Across All Media and All Exposure Routes | | | | 7E-006 | | | | Total Hazard Index Across All Media and All Exposure Routes | | |

TABLE B.9.9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB045 | CPAHs | 3.5E-006 | | 1.4E-006 | 4.9E-006 | CPAHs | Unknown | — | | — | — |
| | | | Benzo(g,h,i)Perylene | — | | — | — | Benzo(g,h,i)Perylene | Unknown | — | | — | — |
| | | | Antimony | — | | — | — | Antimony | Blood | 6.2E-001 | | 6.2E-002 | 6.8E-001 |
| | | | Arsenic | 6.8E-006 | | 1.4E-007 | 6.9E-006 | Arsenic | Skin | 1.8E-001 | | 3.7E-003 | 1.8E-001 |
| | | | Barium | — | | — | — | Barium | CVS | 9.3E-002 | | 9.3E-003 | 1.0E-001 |
| | | | Cadmium | — | | — | — | Cadmium | Kidney | 1.9E-001 | | 1.9E-002 | 2.1E-001 |
| | | | Copper | — | | — | — | Copper | Skin | 6.5E-002 | | 6.5E-003 | 7.2E-002 |
| | | | Iron | — | | — | — | Iron | Unknown | 3.9E-001 | | 3.9E-002 | 4.3E-001 |
| | | | Lead | — | | — | — | Lead | Unknown | — | | — | — |
| | | | (Total) | 1.0E-005 | | 1.5E-006 | 1.2E-005 | (Total) | | 1.5E+000 | | 1.4E-001 | 1.7E+000 |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 1E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | 2E+000 |

| | |
|--------------------|-----|
| Total Blood HI = | 0.7 |
| Total Skin HI = | 0.3 |
| Total CVS HI = | 0.1 |
| Total Kidney HI = | 0.2 |
| Total Unknown HI = | 0.4 |

TABLE B.9.10
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB045 | CPAHs | 1.8E-006 | | 1.8E-006 | 3.6E-006 | | | | | | |
| | | | Benzo(g,h,i)Perylene | - | | - | - | | | | | | |
| | | | Antimony | - | | - | - | | | | | | |
| | | | Arsenic | 3.4E-006 | | 1.8E-007 | 3.6E-006 | | | | | | |
| | | | Barium | - | | - | - | | | | | | |
| | | | Cadmium | - | | - | - | | | | | | |
| | | | Copper | - | | - | - | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Lead | - | | - | - | | | | | | |
| | | | (Total) | 5.2E-006 | | 2.0E-006 | 7.2E-006 | (Total) | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 7E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.9.11
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|-----------------|-------------------|------------|---|-----------------------|-----------------|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Hard Sample BDSB054 | Antimony | - | | - | - | Antimony | Blood | 2.4E-001 | | 2.4E-002 | 2.6E-001 |
| | | | Arsenic | 2.0E-005 | | 4.0E-007 | 2.0E-005 | Arsenic | Skin | 5.2E-001 | | 1.1E-002 | 5.3E-001 |
| | | | Barium | - | | - | - | Barium | CVS | 5.8E-002 | | 5.8E-003 | 6.4E-002 |
| | | | Cadmium | - | | - | - | Cadmium | Kidney | 1.1E-001 | | 1.1E-002 | 1.2E-001 |
| | | | Chromium, Total | - | | - | - | Chromium, Total | Skin | 1.3E-001 | | 1.3E-002 | 1.4E-001 |
| | | | Copper | - | | - | - | Copper | Skin | 4.9E-002 | | 4.9E-003 | 5.4E-002 |
| | | | Iron | - | | - | - | Iron | Unknown | 2.0E+000 | | 2.0E-001 | 2.2E+000 |
| | | | Lead | - | | - | - | Lead | Unknown | - | | - | - |
| | | | Manganese | - | | - | - | Manganese | CNS | 7.2E-002 | | 7.2E-003 | 7.9E-002 |
| | | | Mercury | - | | - | - | Mercury | Nervous System | 2.0E+000 | | | |
| | | | Vanadium | - | | - | - | Vanadium | Unknown | 3.0E-002 | | 3.0E-003 | 3.3E-002 |
| | | | (Total) | 2.0E-005 | | 4.0E-007 | 2.0E-005 | (Total) | | 5.1E+000 | | 2.7E-001 | 3.5E+000 |
| Total Risk Across All Media and All Exposure Routes | | | | 2E-005 | | Total Hazard Index Across All Media and All Exposure Routes | | | | 4E+000 | | | |

| | |
|---------------------------|------|
| Total Blood HI = | 0.3 |
| Total Skin HI = | 0.7 |
| Total CVS HI = | 0.06 |
| Total Kidney HI = | 0.1 |
| Total Unknown HI = | 0.2 |
| Total CNS HI = | 0.08 |
| Total Nervous System HI = | 2 |

380168

TABLE B.9.12
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|-----------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB054 | Antimony | — | | — | — | | | | | | |
| | | | Arsenic | 1.0E-005 | | 5.2E-007 | 1.1E-005 | | | | | | |
| | | | Barium | — | | — | — | | | | | | |
| | | | Cadmium | — | | — | — | | | | | | |
| | | | Chromium, Total | — | | — | — | | | | | | |
| | | | Copper | — | | — | — | | | | | | |
| | | | Iron | — | | — | — | | | | | | |
| | | | Lead | — | | — | — | | | | | | |
| | | | Manganese | — | | — | — | | | | | | |
| | | | Mercury | — | | — | — | | | | | | |
| | | | Vanadium | — | | — | — | | | | | | |
| | | | (Total) | 1.0E-005 | | 5.2E-007 | 1.1E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | 1E-005 | | | | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.9.13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB097 | CPAHs | 9.6E-007 | | 3.8E-007 | 1.3E-006 | CPAHs | Unknown | -- | | -- | -- |
| | | | Benzo(g,h,i)Perylene | -- | | -- | -- | Benzo(g,h,i)Perylene | Unknown | -- | | -- | -- |
| | | | 2,3,7,8-TCDD(TEQ) | 2.8E-005 | | 1.1E-005 | 3.9E-005 | 2,3,7,8-TCDD(TEQ) | Unknown | -- | | -- | -- |
| | | | Antimony | -- | | -- | -- | Antimony | Blood | 7.2E-001 | | 7.2E-002 | 7.9E-001 |
| | | | Arsenic | 3.5E-005 | | 7.1E-007 | 3.6E-005 | Arsenic | Skin | 9.1E-001 | | 1.9E-002 | 9.3E-001 |
| | | | Barium | -- | | -- | -- | Barium | CVS | 1.4E-001 | | 1.4E-002 | 1.5E-001 |
| | | | Cadmium | -- | | -- | -- | Cadmium | Kidney | 2.3E-001 | | 2.3E-002 | 2.5E-001 |
| | | | Chromium, Total | -- | | -- | -- | Chromium, Total | Skin | 3.5E-001 | | 3.5E-002 | 3.9E-001 |
| | | | Copper | -- | | -- | -- | Copper | Skin | 1.5E-001 | | 1.5E-002 | 1.7E-001 |
| | | | Iron | -- | | -- | -- | Iron | Unknown | 4.8E+000 | | 4.8E-001 | 5.3E+000 |
| | | | Lead | -- | | -- | -- | Lead | Unknown | -- | | -- | -- |
| | | | Manganese | -- | | -- | -- | Manganese | CNS | 1.4E-001 | | 1.4E-002 | 1.5E-001 |
| | | | Vanadium | -- | | -- | -- | Vanadium | Unknown | 3.2E-002 | | 3.2E-003 | 3.5E-002 |
| | | | (Total) | 6.4E-005 | | 1.2E-005 | 7.6E-005 | (Total) | | 7.5E+000 | | 6.8E-001 | 8.1E+000 |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 8E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | 8E+000 |

| | |
|--------------------|-----|
| Total Blood HI = | 0.8 |
| Total Skin HI = | 1 |
| Total CVS HI = | 0.2 |
| Total Kidney HI = | 0.3 |
| Total CNS HI = | 0.2 |
| Total Unknown HI = | 5 |

TABLE B.9.14
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB097 | CPAHs | 4.9E-007 | | 4.9E-007 | 9.8E-007 | | | | | | |
| | | | Benzo(g,h,i)Perylene | - | | - | - | | | | | | |
| | | | 2,3,7,8-TCDD(TEQ) | 4.9E-007 | | 4.9E-007 | 9.8E-007 | | | | | | |
| | | | Antimony | - | | - | - | | | | | | |
| | | | Arsenic | 1.8E-005 | | 9.1E-007 | 1.9E-005 | | | | | | |
| | | | Barium | - | | - | - | | | | | | |
| | | | Cadmium | - | | - | - | | | | | | |
| | | | Chromium, Total | - | | - | - | | | | | | |
| | | | Copper | - | | - | - | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Lead | - | | - | - | | | | | | |
| | | | Manganese | - | | - | - | | | | | | |
| | | | Vanadium | - | | - | - | | | | | | |
| (Total) | | | | 1.9E-005 | | 1.9E-006 | 2.1E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | 2E-005 | | | | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.9.15
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | | | | | |
|--------|-----------------|---------------------|---|-------------------|------------|----------|-----------------------|-----------------|----------------------------------|-----------|------------|----------|-----------------------|--|---|--|--|--|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | | | | | |
| Soil | Surface Soil | Yard Sample BDSB101 | Antimony | -- | | -- | -- | Antimony | Blood | 3.2E-001 | | 3.2E-002 | 3.5E-001 | | | | | |
| | | | Arsenic | 1.3E-005 | | 2.7E-007 | 1.3E-005 | Arsenic | Skin | 3.5E-001 | | 7.2E-003 | 3.6E-001 | | | | | |
| | | | Barium | -- | | -- | -- | Barium | CVS | 7.1E-002 | | 7.1E-003 | 7.8E-002 | | | | | |
| | | | Cadmium | -- | | -- | -- | Cadmium | Kidney | 1.7E-001 | | 1.7E-002 | 1.9E-001 | | | | | |
| | | | Chromium, Total | -- | | -- | -- | Chromium, Total | Skin | 1.7E-001 | | 1.7E-002 | 1.9E-001 | | | | | |
| | | | Copper | -- | | -- | -- | Copper | Skin | 1.0E-001 | | 1.0E-002 | 1.1E-001 | | | | | |
| | | | Iron | -- | | -- | -- | Iron | Unknown | 1.8E+000 | | 1.8E-001 | 2.0E+000 | | | | | |
| | | | Lead | -- | | -- | -- | Lead | Unknown | -- | | -- | -- | | | | | |
| | | | Manganese | -- | | -- | -- | Manganese | CNS | 7.1E-002 | | 7.1E-003 | 7.8E-002 | | | | | |
| | | | Vanadium | -- | | -- | -- | Vanadium | Unknown | 4.1E-002 | | 4.1E-003 | 4.5E-002 | | | | | |
| | | | Zinc | -- | | -- | -- | Zinc | Blood | 2.2E-001 | | 2.2E-002 | 2.4E-001 | | | | | |
| | | | (Total) | 1.3E-005 | | 2.7E-007 | 1.3E-005 | (Total) | | 3.3E+000 | | 3.0E-001 | 3.6E+000 | | | | | |
| | | | Total Risk Across All Media and All Exposure Routes | | | | | | 1E-005 | | | | | | Total Hazard Index Across All Media and All Exposure Routes | | | |

| | |
|--------------------|------|
| Total Blood HI = | 0.6 |
| Total Skin HI = | 0.7 |
| Total CVS HI = | 0.08 |
| Total Kidney HI = | 0.2 |
| Total CNS HI = | 0.08 |
| Total Unknown HI = | 2 |

TABLE B.9.16
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| |
|-------------------------------|
| Scenario Timeframe: Current |
| Receptor Population: Resident |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|---------------------|---|-------------------|------------|----------|-----------------------|----------|----------------------------------|-----------|---|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB101 | Antimony | -- | | -- | -- | | | | | | |
| | | | Arsenic | 6.7E-006 | | 3.5E-007 | 7.1E-006 | | | | | | |
| | | | Barium | -- | | -- | -- | | | | | | |
| | | | Cadmium | -- | | -- | -- | | | | | | |
| | | | Chromium, Total | -- | | -- | -- | | | | | | |
| | | | Copper | -- | | -- | -- | | | | | | |
| | | | Iron | -- | | -- | -- | | | | | | |
| | | | Lead | -- | | -- | -- | | | | | | |
| | | | Manganese | -- | | -- | -- | | | | | | |
| | | | Vanadium | -- | | -- | -- | | | | | | |
| | | | Zinc | -- | | -- | -- | | | | | | |
| | | | (Total) | 6.7E-006 | | 3.5E-007 | 7.1E-006 | (Total) | | | | | |
| | | | Total Risk Across All Media and All Exposure Routes | | | | | | | 7E-006 | Total Hazard Index Across All Media and All Exposure Routes | | |

TABLE B.9.17
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|---------------------|---|-------------------|------------|----------|-----------------------|-----------------|----------------------------------|-----------|---|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB130 | Aluminum | | | | | Aluminum | Unknown | 1.0E-001 | | 1.0E-002 | 1.1E-001 |
| | | | Antimony | - | | - | - | Antimony | Blood | 1.1E-001 | | 1.1E-002 | 1.2E-001 |
| | | | Arsenic | 5.8E-006 | | 1.2E-007 | 5.9E-006 | Arsenic | Skin | 1.5E-001 | | 3.1E-003 | 1.5E-001 |
| | | | Barium | - | | - | - | Barium | CVS | 6.3E-002 | | 6.3E-003 | 6.9E-002 |
| | | | Cadmium | - | | - | - | Cadmium | Kidney | 1.3E-001 | | 1.3E-002 | 1.4E-001 |
| | | | Chromium, Total | - | | - | - | Chromium, Total | Skin | 1.2E-001 | | 1.2E-002 | 1.3E-001 |
| | | | Iron | - | | - | - | Iron | Unknown | 4.3E-001 | | 4.3E-002 | 4.7E-001 |
| | | | Lead | - | | - | - | Lead | Unknown | - | | - | - |
| | | | (Total) | 5.8E-006 | | 1.2E-007 | 5.9E-006 | (Total) | | 1.1E+000 | | 9.8E-002 | 1.2E+000 |
| | | | Total Risk Across All Media and All Exposure Routes | | | | 6E-006 | | | | Total Hazard Index Across All Media and All Exposure Routes | | |

Total Blood HI = 0.1
 Total Skin HI = 0.3
 Total CVS HI = 0.07
 Total Kidney HI = 0.1
 Total Unknown HI = 0.6

TABLE B.9.18
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| |
|-------------------------------|
| Scenario Timeframe: Current |
| Receptor Population: Resident |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|-----------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB130 | Aluminum | - | | - | - | | | | | | |
| | | | Antimony | - | | - | - | | | | | | |
| | | | Arsenic | 2.9E-006 | | 1.5E-007 | 3.1E-006 | | | | | | |
| | | | Barium | - | | - | - | | | | | | |
| | | | Cadmium | - | | - | - | | | | | | |
| | | | Chromium, Total | - | | - | - | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Lead | - | | - | - | | | | | | |
| | | | (Total) | 2.9E-006 | | 1.5E-007 | 3.1E-006 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 3E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.9.19
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|---------------------|---|-------------------|------------|----------|-----------------------|--------------------------|----------------------------------|---|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB182 | CPAHs | 2.8E-006 | | 1.1E-006 | 3.9E-006 | CPAHs | Unknown | - | | - | - |
| | | | PCB-1260 (Arochlor 1260) | 5.7E-007 | | 2.2E-007 | 7.9E-007 | PCB-1260 (Arochlor 1260) | Unknown | - | | - | - |
| | | | 2,3,7,8-TCDD(TEQ) | 6.5E-006 | | 2.5E-006 | 9.0E-006 | 2,3,7,8-TCDD(TEQ) | Unknown | - | | - | - |
| | | | Arsenic | 3.8E-006 | | 7.7E-008 | 3.9E-006 | Arsenic | Skin | 1.0E-001 | | 2.1E-003 | 1.0E-001 |
| | | | Copper | - | | - | - | Copper | Skin | 3.6E-002 | | 3.6E-003 | 4.0E-002 |
| | | | Iron | - | | - | - | Iron | Unknown | 2.4E-001 | | 2.4E-002 | 2.8E-001 |
| | | | Lead | - | | - | - | Lead | Unknown | - | | - | - |
| | | | (Total) | 1.4E-005 | | 3.9E-006 | 1.8E-005 | (Total) | | 3.8E-001 | | 3.0E-002 | 4.1E-001 |
| | | | Total Risk Across All Media and All Exposure Routes | | | | | | 2E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | |

Total Skin HI = 0.1
 Total Unknown HI = 0.3

TABLE B.9.20
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| |
|-------------------------------|
| Scenario Timeframe: Current |
| Receptor Population: Resident |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|--------------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB182 | CPAHs | 1.4E-006 | | 1.4E-006 | 2.8E-006 | | | | | | |
| | | | PCB-1260 (Arochlor 1260) | 2.9E-007 | | 2.8E-007 | 5.7E-007 | | | | | | |
| | | | 2,3,7,8-TCDD(TEQ) | 3.3E-006 | | 3.2E-006 | 6.5E-006 | | | | | | |
| | | | Arsenic | 1.9E-006 | | 9.9E-008 | 2.0E-006 | | | | | | |
| | | | Copper | - | | - | - | | | | | | |
| | | | Iron | - | | - | - | | | | | | |
| | | | Lead | - | | - | - | | | | | | |
| | | | (Total) | 6.9E-006 | | 5.0E-006 | 1.2E-005 | (Total) | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 1E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.9.21
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|-------------------|---|-------------------|------------|--------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Water | Groundwater | Tap Sample BDMW04 | Iron | - | | | - | Iron | Unknown | 6.0E+000 | | | 6.0E+000 |
| | | | Lead | - | | | - | Lead | Unknown | - | | | - |
| | | | Manganese | - | | | - | Manganese | CNS | 4.8E-001 | | | 4.8E-001 |
| | | | (Total) | | | | - | (Total) | | 6.5E+000 | | | 6.5E+000 |
| | | | Total Risk Across All Media and All Exposure Routes | | | | - | Total Hazard Index Across All Media and All Exposure Routes | | | | | 7E+000 |

Total Unknown HI = 6
Total CNS HI = 0.5

TABLE B.9.22 *
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| |
|-------------------------------|
| Scenario Timeframe: Current |
| Receptor Population: Resident |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|-------------------|---|-------------------|------------|--------|-----------------------|----------|---|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Water | Groundwater | Tap Sample BDMW04 | Iron | - | | | - | | | | | | |
| | | | Lead | - | | | - | | | | | | |
| | | | Manganese | - | | | - | | | | | | |
| | | | (Total) | - | | | - | | | | | | |
| | | | Total Risk Across All Media and All Exposure Routes | | | | - | | Total Hazard Index Across All Media and All Exposure Routes | | | | |

* Groundwater sample BDMW04 contained only three COPCs - iron, lead and manganese. None of these COPCs are carcinogenic; therefore, no carcinogenic risks are shown on the table. Noncarcinogenic hazard quotients were not calculated for adult residents; therefore, no hazard quotients are presented.

TABLE B.9.23
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | | |
|---|-----------------|--------------------|----------|-------------------|------------|--------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|--|--------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | | |
| Water | Groundwater | Tap Sample BDMW009 | Arsenic | 3.0E-005 | | | 3.0E-005 | Arsenic | Skin | 7.7E-001 | | | 7.7E-001 | | |
| | | | Iron | — | | | — | Iron | Unknown | 4.1E-001 | | | 4.1E-001 | | |
| | | | (Total) | 3.0E-005 | | | 3.0E-005 | (Total) | | 1.2E+000 | | | 1.2E+000 | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 3E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | | 1E+000 |

Total Skin HI = 0.8
Total Unknown HI = 0.4

TABLE B.9.24
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|--------------------|----------|-------------------|------------|--------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Water | Groundwater | Tap Sample BDMW009 | Arsenic | 5.9E-005 | | | 5.9E-005 | | | | | | |
| | | | | - | | | - | | | | | | |
| | | | (Total) | 5.9E-005 | | | 5.9E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 6E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.9.25
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|--------------------|---|-------------------|------------|--------|-----------------------|-------------------------|----------------------------------|---|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Water | Groundwater | Tap Sample BDMW010 | Iron | — | | | — | Iron | Unknown | 6.0E-001 | | | 6.0E-001 |
| | | | Aldrin | 2.1E-005 | | | 2.1E-005 | Aldrin | Liver | 4.7E-001 | | | 4.7E-001 |
| | | | Chlordane | 9.6E-007 | | | 9.6E-007 | Chlordane | Unknown | 6.4E-002 | | | 6.4E-002 |
| | | | Heptachlor | 3.2E-006 | | | 3.2E-006 | Heptachlor | Liver | 1.7E-002 | | | 1.7E-002 |
| | | | Heptachlor Epoxide | 2.0E-005 | | | 2.0E-005 | Heptachlor Epoxide | Liver | 1.9E+000 | | | 1.9E+000 |
| | | | p,p'-DDT | 6.2E-007 | | | 6.2E-007 | p,p'-DDT | Unknown | 4.2E-002 | | | 4.2E-002 |
| | | | PCB 1016 (Aroclor 1016) | 5.8E-007 | | | 5.8E-007 | PCB 1016 (Aroclor 1016) | Unknown | 1.4E+000 | | | 1.4E+000 |
| | | | (Total) | 4.6E-005 | | | 4.6E-005 | (Total) | | 4.5E+000 | | | 4.5E+000 |
| | | | Total Risk Across All Media and All Exposure Routes | | | | | | 5E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | |

Total Liver HI = 2
 Total Unknown HI = 2

TABLE B.9.28
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|--------------------|-------------------------|-------------------|------------|--------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Water | Groundwater | Tap Sample BDMW010 | Iron | — | | | — | | | | | | |
| | | | Aldrin | 4.1E-005 | | | 4.1E-005 | | | | | | |
| | | | Chlordane | 1.9E-006 | | | 1.9E-006 | | | | | | |
| | | | Heptachlor | 6.4E-006 | | | 6.4E-006 | | | | | | |
| | | | Heptachlor Epoxide | 3.9E-005 | | | 3.9E-005 | | | | | | |
| | | | p,p'-DDT | 1.2E-006 | | | 1.2E-006 | | | | | | |
| | | | PCB 1016 (Aroclor 1016) | 1.2E-006 | | | 1.2E-006 | | | | | | |
| | | | (Total) | 9.1E-005 | | | 9.1E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 9E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.1
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| |
|-------------------------------|
| Scenario Timeframe: Current |
| Receptor Population: Resident |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB009 | CPAHs | 2.8E-005 | | 1.1E-005 | 3.9E-005 | | | | | | |
| | | | | | | | | | | | | | |
| | | | (Total) | 2.8E-005 | | 1.1E-005 | 3.9E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 4E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.2
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| |
|-------------------------------|
| Scenario Timeframe: Current |
| Receptor Population: Resident |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|--|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | |
| Soil | Surface Soil | Yard Sample BDSB009 | CPAHs | 1.4E-005 | | 1.4E-005 | 2.6E-005 | | | | | | | |
| | | | | (Total) 1.4E-005 | | 1.4E-005 | 2.8E-005 | | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 3E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | |

TABLE B.10.3
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|--|--------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | | |
| Soil | Surface Soil | Yard Sample BDSB012 | Aldrin | 3.0E-006 | | 1.1E-006 | 4.1E-006 | Antimony | Blood | 4.2E-001 | | 4.2E-002 | 4.6E-001 | | |
| | | | CPAHs | 2.6E-006 | | 1.0E-006 | 3.6E-006 | Arsenic | Skin | 1.1E-001 | | 2.3E-003 | 1.1E-001 | | |
| | | | Arsenic | 4.3E-006 | | 8.7E-008 | 4.4E-006 | Barium | CVS | 1.5E-001 | | 1.5E-002 | 1.7E-001 | | |
| | | | | | | | | Chromium, Total | Skin | 2.9E-001 | | 2.9E-002 | 3.2E-001 | | |
| | | | | | | | | Iron | Unknown | 5.2E-001 | | 5.2E-002 | 5.7E-001 | | |
| (Total) | | | | 9.9E-006 | | 2.2E-006 | 1.2E-005 | (Total) | | 1.5E+000 | | 1.4E-001 | 1.6E+000 | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 1E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | | 2E+000 |

| | |
|--------------------|-----|
| Total Blood HI = | 0.5 |
| Total Skin HI = | 0.4 |
| Total CVS HI = | 0.2 |
| Total Unknown HI = | 0.6 |

TABLE B.10.4
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB012 | Aldrin | 1.5E-006 | | 1.5E-006 | 3.0E-006 | | | | | | |
| | | | CPAHs | 1.3E-006 | | 1.3E-006 | 2.6E-006 | | | | | | |
| | | | Arsenic | 2.2E-006 | | 1.1E-007 | 2.3E-006 | | | | | | |
| | | | | | | | | | | | | | |
| | | | (Total) | 5.0E-006 | | 2.9E-006 | 7.9E-006 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 8E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.5
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| |
|-------------------------------|
| Scenario Timeframe: Current |
| Receptor Population: Resident |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB014 | Arsenic | 5.6E-006 | | 1.1E-007 | 5.7E-006 | | | | | | |
| | | | | 1.4E-006 | | 5.4E-007 | 1.9E-006 | | | | | | |
| | | | (Total) | 7.0E-006 | | 6.5E-007 | 7.6E-006 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 8E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.6
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB014 | Arsenic | 2.9E-006 | | 1.5E-007 | 3.1E-006 | | | | | | |
| | | | | 6.9E-007 | | 6.9E-007 | 1.4E-006 | | | | | | |
| | | | (Total) | 3.6E-006 | | 8.4E-007 | 4.4E-006 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 4E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.7
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|--------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB039 | Arsenic | 2.1E-006 | | 4.4E-008 | 2.1E-006 | | | | | | |
| | | | CPAHs | 1.4E-006 | | 5.4E-007 | 1.9E-006 | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) | 4.6E-006 | | 1.7E-006 | 6.3E-006 | | | | | | |
| | | | | | | | | | | | | | |
| | | | (Total) | 8.1E-006 | | 2.3E-006 | 1.0E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 1E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.8
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|--------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB039 | Arsenic | 1.1E-006 | | 5.6E-008 | 1.2E-006 | | | | | | |
| | | | CPAHs | 6.9E-007 | | 6.9E-007 | 1.4E-006 | | | | | | |
| | | | 2,3,7,8-TCDD (TEQ) | 2.3E-006 | | 2.2E-006 | 4.5E-006 | | | | | | |
| | | | (Total) | 4.1E-006 | | 2.9E-006 | 7.0E-006 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 7E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.9
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB045 | CPAHs | 3.5E-006 | | 1.4E-006 | 4.9E-006 | Antimony | Blood | 6.2E-001 | | 6.2E-002 | 6.8E-001 |
| | | | Arsenic | 6.8E-006 | | 1.4E-007 | 6.9E-006 | Arsenic | Skin | 1.8E-001 | | 3.7E-003 | 1.8E-001 |
| | | | | | | | | Barium | CVS | 9.3E-002 | | 9.3E-003 | 1.0E-001 |
| | | | | | | | | Cadmium | Kidney | 1.9E-001 | | 1.9E-002 | 2.1E-001 |
| | | | | | | | | Copper | Skin | 6.5E-002 | | 6.5E-003 | 7.2E-002 |
| | | | | | | | | Iron | Unknown | 3.9E-001 | | 3.9E-002 | 4.3E-001 |
| | | | (Total) | 1.0E-005 | | 1.5E-006 | 1.2E-005 | (Total) | | 1.5E+000 | | 1.4E-001 | 1.7E+000 |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 1E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | 2E+000 |

| | |
|--------------------|-----|
| Total Blood HI = | 0.7 |
| Total Skin HI = | 0.2 |
| Total CVS HI = | 0.1 |
| Total Kidney HI = | 0.2 |
| Total Unknown HI = | 0.4 |

TABLE B.10.10
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|--|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | |
| Soil | Surface Soil | Yard Sample BDSB045 | CPAHs | 1.8E-006 | | 1.8E-006 | 3.6E-006 | | | | | | | |
| | | | Arsenic | 3.4E-006 | | 1.8E-007 | 3.6E-006 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | (Total) | 5.2E-006 | | 2.0E-006 | 7.2E-006 | (Total) | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 7E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | |

TABLE B.10.11
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medlum | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB054 | Arsenic | 2.0E-005 | | 4.0E-007 | 2.0E-005 | Antimony | Blood | 2.4E-001 | | 2.4E-002 | 2.6E-001 |
| | | | | | | | | Arsenic | Skin | 5.2E-001 | | 1.1E-002 | 5.3E-001 |
| | | | | | | | | Cadmium | Kidney | 1.1E-001 | | 1.1E-002 | 1.2E-001 |
| | | | | | | | | Chromium, Total | Skin | 1.3E-001 | | 1.3E-002 | 1.4E-001 |
| | | | | | | | | Iron | Unknown | 2.0E+000 | | 2.0E-001 | 2.2E+000 |
| | | | | | | | | Mercury | Nervous System | 2.0E+000 | | 2.0E-001 | 2.0E+000 |
| | | | (Total) | | 2.0E-005 | | 4.0E-007 | 2.0E-005 | (Total) | | 5.0E+000 | | 4.6E-001 |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 2E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | 5E+000 |

| | |
|---------------------------|-----|
| Total Blood HI = | 0.3 |
| Total Skin HI = | 0.7 |
| Total Kidney HI = | 0.1 |
| Total Unknown HI = | 2 |
| Total Nervous System HI = | 2 |

TABLE B.10.12
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB054 | Arsenic | 1.0E-005 | | 5.2E-007 | 1.1E-005 | | | | | | |
| | | | (Total) | 1.0E-005 | | 5.2E-007 | 1.1E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 1E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.13
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|-------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB097 | CPAHs | 9.6E-007 | | 3.8E-007 | 1.3E-006 | Antimony | Blood | 7.2E-001 | | 7.2E-002 | 7.9E-001 |
| | | | 2,3,7,8-TCDD(TEQ) | 2.8E-005 | | 1.1E-005 | 3.9E-005 | Arsenic | Skin | 9.1E-001 | | 1.9E-002 | 9.3E-001 |
| | | | Arsenic | 3.5E-005 | | 7.1E-007 | 3.6E-005 | Barium | CVS | 1.4E-001 | | 1.4E-002 | 1.5E-001 |
| | | | | | | | | Cadmium | Kidney | 2.3E-001 | | 2.3E-002 | 2.5E-001 |
| | | | | | | | | Chromium, Total | Skin | 3.5E-001 | | 3.5E-002 | 3.9E-001 |
| | | | | | | | | Copper | Skin | 1.5E-001 | | 1.5E-002 | 1.7E-001 |
| | | | | | | | | Iron | Unknown | 4.8E+000 | | 4.8E-001 | 5.3E+000 |
| | | | | | | | | Manganese | CNS | 1.4E-001 | | 1.4E-002 | 1.5E-001 |
| | | | (Total) | 6.4E-005 | | 1.2E-005 | 7.6E-005 | (Total) | | 7.4E+000 | | 6.7E-001 | 8.1E+000 |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 8E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | 8E+000 |

| | |
|--------------------|-----|
| Total Blood HI = | 0.8 |
| Total Skin HI = | 1 |
| Total CVS HI = | 0.2 |
| Total Kidney HI = | 0.3 |
| Total CNS HI = | 0.2 |
| Total Unknown HI = | 5 |

TABLE B.10.14
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB097 | Arsenic | 1.8E-005 | | 9.1E-007 | 1.9E-005 | | | | | | |
| (Total) | | | | 1.8E-005 | | 9.1E-007 | 1.9E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 2E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.15
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|----------|-----------------------|--|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | |
| Soil | Surface Soil | Yard Sample BDSB101 | Arsenic | 1.3E-005 | | 2.7E-007 | 1.3E-005 | Antimony | Blood | 3.2E-001 | | 3.2E-002 | 3.5E-001 | |
| | | | | | | | | Arsenic | Skin | 3.5E-001 | | 7.2E-003 | 3.6E-001 | |
| | | | | | | | | Cadmium | Kidney | 1.7E-001 | | 1.7E-002 | 1.9E-001 | |
| | | | | | | | | Chromium, Total | Skin | 1.7E-001 | | 1.7E-002 | 1.9E-001 | |
| | | | | | | | | Copper | Skin | 1.0E-001 | | 1.0E-002 | 1.1E-001 | |
| | | | | | | | | Zinc | Blood | 2.2E-001 | | 2.2E-002 | 2.4E-001 | |
| | | | | | | | | Iron | Unknown | 1.8E+000 | | 1.8E-001 | 2.0E+000 | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | (Total) | 1.3E-005 | | 2.7E-007 | 1.3E-005 | (Total) | | 3.1E+000 | | 2.9E-001 | 3.4E+000 | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 1E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | 3E+000 | |

Total Blood HI = 0.6
 Total Skin HI = 0.7
 Total Kidney HI = 0.2
 Total Unknown HI = 2

TABLE B.10.16
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|---------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | |
| Soil | Surface Soil | Yard Sample BDSB101 | Arsenic | 6.7E-006 | | 3.5E-007 | 7.1E-006 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | (Total) | 6.7E-006 | | 3.5E-007 | 7.1E-006 | | | | | | | (Total) |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 7E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | |

TABLE B.10.17
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|-----------------|---|-----------|------------|----------|-----------------------|----------|--|--------|--|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | | | | |
| Soil | Surface Soil | Yard Sample BDSB130 | Arsenic | 5.8E-006 | | 1.2E-007 | 5.9E-006 | Aluminum | Unknown | 1.0E-001 | | 1.0E-002 | 1.1E-001 | | | | |
| | | | | | | | | Antimony | Blood | 1.1E-001 | | 1.1E-002 | 1.2E-001 | | | | |
| | | | | | | | | Arsenic | Skin | 1.5E-001 | | 3.1E-003 | 1.5E-001 | | | | |
| | | | | | | | | Cadmium | Kidney | 1.3E-001 | | 1.3E-002 | 1.4E-001 | | | | |
| | | | | | | | | Chromium, Total | Skin | 1.2E-001 | | 1.2E-002 | 1.3E-001 | | | | |
| | | | | | | | | Iron | Unknown | 4.3E-001 | | 4.3E-002 | 4.7E-001 | | | | |
| | | | (Total) | | 5.8E-006 | | 1.2E-007 | 5.9E-006 | (Total) | | 1.1E+000 | | 9.8E-002 | 1.2E+000 | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 6E-006 | | Total Hazard Index Across All Media and All Exposure Routes | | | | | | | 1E+000 | |

Total Blood HI = 0.1
 Total Skin HI = 0.2
 Total Kidney HI = 0.1
 Total Unknown HI = 0.8

TABLE B.10.18
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|----------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB130 | Arsenic | 2.9E-006 | | 1.5E-007 | 3.1E-006 | | | | | | |
| | | | (Total) | 2.9E-006 | | 1.5E-007 | 3.1E-006 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 3E-006 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.19
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|---------------------|-------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Soil | Surface Soil | Yard Sample BDSB182 | CPAHs | 2.8E-006 | | 1.1E-006 | 3.9E-006 | | | | | | |
| | | | 2,3,7,8-TCDD(TEQ) | 6.5E-006 | | 2.5E-006 | 9.0E-006 | | | | | | |
| | | | Arsenic | 3.8E-006 | | 7.7E-008 | 3.9E-006 | | | | | | |
| | | | (Total) | 1.3E-005 | | 3.7E-006 | 1.7E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 2E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.20
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| |
|-------------------------------|
| Scenario Timeframe: Current |
| Receptor Population: Resident |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | |
|---|-----------------|---------------------|-------------------|-------------------|------------|----------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|--|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | |
| Soil | Surface Soil | Yard Sample BDSB182 | CPAHs | 1.4E-006 | | 1.4E-006 | 2.8E-006 | | | | | | | |
| | | | 2,3,7,8-TCDD(TEQ) | 3.3E-006 | | 3.2E-006 | 6.5E-006 | | | | | | | |
| | | | Arsenic | 1.9E-006 | | 9.9E-008 | 2.0E-006 | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | (Total) | 6.6E-006 | | 4.7E-006 | 1.1E-005 | (Total) | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 1E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | |

TABLE B.10.21
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
 Receptor Population: Resident
 Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | | |
|---|-----------------|----------------------|----------|-------------------|------------|--------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|--|--------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | | |
| Water | Groundwater | Tap Sample BDMW04 | | | | | | Iron Manganese (Total) | Unknown CNS | 6.0E+000 | | | 6.0E+000 | | |
| | | | | | | | | | | 4.8E-001 | | | 4.8E-001 | | |
| | | | | | | | | | | 6.5E+000 | | | 6.5E+000 | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | | Total Hazard Index Across All Media and All Exposure Routes | | | | | | | 7E+000 |

Total Unknown HI = 6
 Total CNS HI = 0.5

TABLE B.10.22 *
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| |
|-------------------------------|
| Scenario Timeframe: Current |
| Receptor Population: Resident |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|----------------------|---|-------------------|------------|--------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Water | Groundwater | Tap Sample BDMW04 | Iron | — | | | — | | | | | | |
| | | | Lead | — | | | — | | | | | | |
| | | | Manganese | — | | | — | | | | | | |
| | | | (Total) | — | | | — | | | | | | |
| | | | Total Risk Across All Media and All Exposure Routes | | | | — | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

* Groundwater sample BDMW04 contained only three COPCs - iron, lead and manganese. Neither of these COPCs are carcinogenic; therefore, no carcinogenic risks are shown on the table. Noncarcinogenic hazard quotients were not calculated for adult residents; therefore, no hazard quotients are presented.

TABLE B.10.23
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

| |
|-------------------------------|
| Scenario Timeframe: Current |
| Receptor Population: Resident |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|--------------------|----------|-------------------|------------|--------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Water | Groundwater | Tap Sample BDMW009 | Arsenic | 3.0E-005 | | | 3.0E-005 | | | | | | |
| | | | (Total) | 3.0E-005 | | | 3.0E-005 | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 3E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | |

TABLE B.10.24
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | | |
|---|-----------------|--------------------|----------|-------------------|------------|--------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|--|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total | |
| Water | Groundwater | Tap Sample BDMW009 | Arsenic | 5.9E-005 | | | 5.9E-005 | | | | | | | |
| | | | (Total) | 5.9E-005 | | | 5.9E-005 | | | | | | | |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 6E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | | |

TABLE B.10.25
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|-----------------|--------------------|--------------------|-------------------|------------|--------|-----------------------|---|----------------------------------|-----------|------------|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Water | Groundwater | Tap Sample BDMW010 | Aldrin | 2.1E-005 | | | 2.1E-005 | Iron | Unknown | 6.0E-001 | | | 6.0E-001 |
| | | | Heptachlor | 3.2E-006 | | | 3.2E-006 | Aldrin | Liver | 4.7E-001 | | | 4.7E-001 |
| | | | Heptachlor Epoxide | 2.0E-005 | | | 2.0E-005 | Heptachlor Epoxide | Liver | 1.9E+000 | | | 1.9E+000 |
| | | | | | | | | PCB 1016 (Aroclor 1016) | Unknown | 1.4E+000 | | | 1.4E+000 |
| | | | (Total) | 4.4E-005 | | | 4.4E-005 | (Total) | | 4.4E+000 | | | 4.4E+000 |
| Total Risk Across All Media and All Exposure Routes | | | | | | | 4E-005 | Total Hazard Index Across All Media and All Exposure Routes | | | | | 4E+000 |

Total Liver HI = 2
Total Unknown HI = 2

TABLE B.10.26
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|--------|-----------------|--------------------|---|-------------------|------------|--------|-----------------------|----------|----------------------------------|-----------|---|--------|-----------------------|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Water | Groundwater | Tap Sample BDMW010 | Aldrin | 4.1E-005 | | | 4.1E-005 | | | | | | |
| | | | Gamma-Chlordane | 1.9E-006 | | | 1.9E-006 | | | | | | |
| | | | Heptachlor | 6.4E-006 | | | 6.4E-006 | | | | | | |
| | | | Heptachlor Epoxide | 3.9E-005 | | | 3.9E-005 | | | | | | |
| | | | p,p'-DDT | 1.2E-006 | | | 1.2E-006 | | | | | | |
| | | | PCB 1016 (Aroclor 1016) | 1.2E-006 | | | 1.2E-006 | | | | | | |
| | | | (Total) | 9.1E-005 | | | 9.1E-005 | | | | | | |
| | | | Total Risk Across All Media and All Exposure Routes | | | | 9E-005 | | | | Total Hazard Index Across All Media and All Exposure Routes | | |

TABLE B.11.1
RISK-BASED REMEDIAL GOAL OPTIONS
CURRENT CHILD AND ADULT RESIDENT - SURFACE/SUBSURFACE SOIL
BROWN'S DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

| CHEMICAL | HAZARD INDEX * | | | CARCINOGENIC RISK | | | EPA ARARs |
|-------------------------|----------------|--------|---------|-------------------|---------|--------|--------------|
| | (mg/kg) | | | (mg/kg) | | | (mg/kg) |
| | 0.1 | 1 | 3 | 10-6 | 10-5 | 10-4 | |
| CPAHs | -- | -- | -- | 0.07 | 0.7 | 7 | -- |
| Aldrin | -- | -- | -- | 0.04 | 0.4 | 4 | -- |
| gamma-Chlordane | 2.7 | 2.7 | 81 | 1.85 | 18.5 | 185 | -- |
| Dieldrin | -- | -- | -- | 0.04 | 0.4 | 4 | -- |
| PCB 1260 (Aroclor 1260) | -- | -- | -- | 0.26 | 2.6 | 26 | -- |
| 2,3,7,8-TCDD (Dioxin) | -- | -- | -- | 0.000003 | 0.00003 | 0.0003 | 0.001** |
| Antimony | 2.9 | 29 | 87 | -- | -- | -- | -- |
| Aluminum | 6,990 | 69,900 | 209,700 | -- | -- | -- | -- |
| Arsenic | 2.3 | 23 | 69 | 0.58 | 5.8 | 58 | -- |
| Barium | 496 | 4,960 | 14,880 | -- | -- | -- | -- |
| Cadmium | 3.5 | 35 | 105 | -- | -- | -- | -- |
| Chromium | 21.1 | 211 | 633 | -- | -- | -- | -- |
| Copper | 281 | 2,810 | 8,430 | -- | -- | -- | -- |
| Iron | 2,105 | 21,050 | 63,150 | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | 400 ** |
| Manganese | 479 | 4,790 | 14,370 | -- | -- | -- | -- |
| Mercury | 0.7 | 7 | 21 | -- | -- | -- | -- |
| Vanadium | 43 | 430 | 1,290 | -- | -- | -- | -- |
| Zinc | 2,121 | 21,210 | 63,630 | -- | -- | -- | -- |
| | | | | | | | |
| | | | | | | | |

Notes:
 * Based on Child Exposure Only.
 ** These values are based on EPA OSWER Directives.
 -- Not Applicable

TABLE B.11.2
RISK-BASED REMEDIAL GOAL OPTIONS
FUTURE CHILD AND ADULT RESIDENT - GROUNDWATER
BROWN'S DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

| CHEMICAL | HAZARD INDEX * | | | CARCINOGENIC RISK | | | EPA Maximum Contaminant Levels (MCLs) | Florida MCLs |
|-------------------------|----------------|--------|--------|-------------------|------------------|------------------|--|--------------|
| | (mg/L) | | | (mg/L) | | | (mg/L) | (mg/L) |
| | 0.1 | 1 | 3 | 10 ⁻⁶ | 10 ⁻⁵ | 10 ⁻⁴ | | |
| Aldrin | — | — | — | 0.000005 | 0.00005 | 0.0005 | NE | NE |
| Chlordane | 0.0008 | 0.008 | 0.024 | 0.0003 | 0.003 | 0.3 | 0.002 | NE |
| p,p'-DDT | 0.0008 | 0.008 | 0.024 | 0.0003 | 0.003 | 0.03 | NE | NE |
| Heptachlor | 0.0008 | 0.008 | 0.024 | 0.00002 | 0.0002 | 0.002 | 0.0004 | 0.0004 |
| Heptachlor Epoxide | 0.00002 | 0.0002 | 0.0006 | 0.00001 | 0.0001 | 0.001 | 0.0002 | 0.0002 |
| PCB 1016 (Aroclor 1016) | 0.0001 | 0.001 | 0.003 | 0.0002 | 0.002 | 0.02 | 0.0005 | 0.0005 |
| Arsenic | 0.0005 | 0.005 | 0.015 | 0.00004 | 0.0004 | 0.004 | 0.05/0.01 (January 2001) ** | 0.05/NE |
| Iron | 0.5 | 5 | 15 | — | — | — | NE | 0.3 |
| Lead | — | — | — | — | — | — | 0.015 | 0.015 |
| Manganese | 0.03 | 0.3 | 0.9 | — | — | — | NE | 0.05 |

Notes:

- * Based on Child Exposure Only.
- ** In January 2001, the MCL for Arsenic was changed to 0.01 ug/L. However, this value is still under review.
- Not Applicable
- NE Not Established

Table B.12.1
Comparison of Ten Selected Soil Samples to RGOs
Brown's Dump Site
Jacksonville, Florida

| Station ID | Compound | EPC | Units | CPAHs -TEF | RGO* | Exceed |
|----------------|--------------------------|--------------|--------------|-------------|-------------|--------------|
| BDSB009 | LEAD | 39000 | MG/KG | | 400 | YES |
| BDSB009 | ALUMINUM | 26000 | MG/KG | | 69,900 N | NO |
| BDSB009 | INDENO(1,2,3-c,d)PYRENE | 1.8 | MG/KG | 0.18 | | |
| BDSB009 | BENZO(a)ANTHRACENE | 2.5 | MG/KG | 0.25 | | |
| BDSB009 | BENZO(b)FLUORANTHENE | 2.8 | MG/KG | 0.28 | | |
| BDSB009 | BENZO(a)PYRENE | 3 | MG/KG | 3 | | |
| BDSB009 | TEF CPAHs | -- | MG/KG | 3.53 | 0.07 | C YES |
| BDSB009 | ARSENIC | 13 | MG/KG | | 23 N | NO |
| BDSB012 | LEAD | 1300 | MG/KG | | 400 | YES |
| BDSB012 | ARSENIC | 2.6 | MG/KG | | 23** N | NO |
| BDSB012 | ANTIMONY | 13 | MG/KG | | 29 N | NO |
| BDSB012 | CHROMIUM, TOTAL | 66 | MG/KG | | 211 N | NO |
| BDSB012 | COPPER | 200 | MG/KG | | 2,810 N | NO |
| BDSB012 | MANGANESE | 390 | MG/KG | | 4,790 N | NO |
| BDSB012 | BARIUM | 810 | MG/KG | | 4,960 N | NO |
| BDSB012 | ALDRIN | 0.16 | MG/KG | | 0.04 C | YES |
| BDSB012 | GAMMA-CHLORDANE | 0.46 | MG/KG | | 1.85 C | NO |
| BDSB012 | BENZO(a)PYRENE | 0.32 | MG/KG | | 0.07 C | YES |
| BDSB182 | LEAD | 158 | MG/KG | | 400 | YES |
| BDSB182 | ARSENIC | 2.3 | MG/KG | | 23** N | NO |
| BDSB182 | COPPER | 110 | MG/KG | | 2,810 N | NO |
| BDSB182 | PCB-1260 (AROCHLOR 1260) | 0.26 | MG/KG | | 0.3 C | NO |
| BDSB182 | BENZO(a)PYRENE | 0.35 | MG/KG | | 0.07 | C YES |
| BDSB182 | TEQ OF 2,3,7,8-TCDD | 0.0000396 | MG/KG | | 0.001*** C | NO |
| BDSB097 | LEAD | 2600 | MG/KG | | 400 | YES |
| BDSB097 | CADMIUM | 8.7 | MG/KG | | 35 N | NO |
| BDSB097 | VANADIUM | 17 | MG/KG | | 483 N | NO |
| BDSB097 | ARSENIC | 21 | MG/KG | | 23** N | NO |
| BDSB097 | ANTIMONY | 22 | MG/KG | | 29 N | NO |
| BDSB097 | CHROMIUM, TOTAL | 81 | MG/KG | | 211 N | NO |
| BDSB097 | COPPER | 460 | MG/KG | | 2,810 N | NO |
| BDSB097 | BARIUM | 740 | MG/KG | | 4,960 N | NO |
| BDSB097 | MANGANESE | 760 | MG/KG | | 4,790 N | NO |
| BDSB097 | BENZO(a)PYRENE | 0.12 | MG/KG | | 0.07 | C YES |
| BDSB097 | TEQ OF 2,3,7,8-TCDD | 0.0001687 | MG/KG | | 0.001*** C | NO |
| BDSB045 | LEAD | 2100 | MG/KG | | 400 | YES |
| BDSB045 | ARSENIC | 4.1 | MG/KG | | 23** N | NO |
| BDSB045 | CADMIUM | 7.2 | MG/KG | | 35 N | NO |
| BDSB045 | ANTIMONY | 19 | MG/KG | | 29 N | NO |
| BDSB045 | COPPER | 200 | MG/KG | | 2,810 N | NO |
| BDSB045 | BARIUM | 500 | MG/KG | | 4,960 N | NO |
| BDSB045 | BENZO(a)PYRENE | 0.44 | MG/KG | | 0.07 | C YES |

Table B.12.1
Comparison of Ten Selected Soil Samples to RGOs
Brown's Dump Site
Jacksonville, Florida

| Station ID | Compound | EPC | Units | CPAHs -TEF | RGO* | Exceed |
|----------------|-----------------------|-------------|--------------|------------|---------------|------------|
| BDSB101 | LEAD | 860 | MG/KG | | 400 | YES |
| BDSB101 | CADMIUM | 6.5 | MG/KG | | 35 N | NO |
| BDSB101 | ARSENIC | 8 | MG/KG | | 23** N | NO |
| BDSB101 | ANTIMONY | 9.8 | MG/KG | | 29 N | NO |
| BDSB101 | VANADIUM | 22 | MG/KG | | 483 N | NO |
| BDSB101 | CHROMIUM, TOTAL | 39 | MG/KG | | 211 N | NO |
| BDSB101 | COPPER | 320 | MG/KG | | 2,810 N | NO |
| BDSB101 | BARIUM | 380 | MG/KG | | 4,960 N | NO |
| BDSB101 | MANGANESE | 380 | MG/KG | | 4,790 N | NO |
| BDSB101 | ZINC | 5100 | MG/KG | | 21,210 N | NO |
| | | | | | | |
| BDSB130 | LEAD | 340 | MG/KG | | 400 | NO |
| BDSB130 | ANTIMONY | 3.4 | MG/KG | | 29 N | NO |
| BDSB130 | ARSENIC | 3.5 | MG/KG | | 23** N | NO |
| BDSB130 | CADMIUM | 5.1 | MG/KG | | 35 N | NO |
| BDSB130 | CHROMIUM, TOTAL | 27 | MG/KG | | 211 N | NO |
| BDSB130 | BARIUM | 340 | MG/KG | | 4,960 N | NO |
| BDSB130 | ALUMINUM | 7900 | MG/KG | | 69,900 N | NO |
| | | | | | | |
| BDSB54 | LEAD | 630 | MG/KG | | 400 | YES |
| BDSB54 | ANTIMONY | 7.4 | MG/KG | | 29 N | NO |
| BDSB54 | ARSENIC | 12 | MG/KG | | 23** N | NO |
| BDSB54 | CADMIUM | 4.3 | MG/KG | | 35 N | NO |
| BDSB54 | CHROMIUM, TOTAL | 31 | MG/KG | | 211 N | NO |
| BDSB54 | BARIUM | 310 | MG/KG | | 4,960 N | NO |
| BDSB54 | VANADIUM | 16 | MG/KG | | 483 N | NO |
| BDSB54 | COPPER | 150 | MG/KG | | 2,810 N | NO |
| BDSB54 | MANGANESE | 390 | MG/KG | | 4,790 N | NO |
| | | | | | | |
| BDSB014 | LEAD | 133 | MG/KG | | 400 | NO |
| BDSB014 | ARSENIC | 3.4 | MG/KG | | 23** N | NO |
| BDSB014 | BENZO(a)PYRENE | 0.17 | MG/KG | | 0.07 C | YES |
| | | | | | | |
| BDSB039 | LEAD | 158 | MG/KG | | 400 N | NO |
| BDSB039 | ARSENIC | 1.3 | MG/KG | | 23** N | NO |
| BDSB039 | BENZO(a)PYRENE | 0.17 | MG/KG | | 0.07 C | YES |
| BDSB039 | TEQ OF 2,3,7,8-TCDD | 0.0000277 | MG/KG | | 0.001*** C | NO |

NOTE:

* Value corresponds to a HQ = 1 or a cancer risk = 1E-06, whichever is lower.

** This value was selected as the RGO for arsenic per EPA Region 4 policy.

*** This value was selected as the RGO for dioxin per EPA Region 4 policy.

N - Noncarcinogen

C - Carcinogen

TABLE B.13.1
SURFACE SOIL SAMPLES COLLECTED IN YARDS
CANCER RISK AND HAZARD CALCULATIONS
CHILD AND ADULT
BROWN'S DUMP

| Units | EPC | Units | CPAHs -TEF | Child - Intake - Ingestion - Noncancer | Child - Intake - Dermal - Noncancer | Child - Intake - Ingestion - Cancer | Child - Intake - Dermal - Cancer | Adult - Intake - Ingestion - Cancer | Adult - Intake - Dermal - Cancer | Referenc e Dose - Oral | Referenc e Dose - Dermal | Slope Factor - Oral | Slope Factor - Dermal | Child Hazard - Ingestion | Child Hazard Dermal | Child Risk - Ingestion | Child Risk Dermal | Adult Risk - Ingestion | Adult Risk Dermal | Total Child Hazard | Total Child Risk | Total Adult Risk | Total Lifetime Risk |
|--------|----------|-------|------------|---|--|--|---|--|---|------------------------------|--------------------------------|------------------------|--------------------------|--------------------------------|---------------------------|---------------------------|----------------------|---------------------------|----------------------|--------------------------|------------------------|---------------------|---------------------------|
| MG/KG | 39000 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MG/KG | 26000 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 1.0E+00 | 2.0E-01 | - | - | 3.4E-01 | 3.4E-02 | - | - | - | - | 3.7E-01 | - | - | - |
| UG/KG | 1.8 | MG/KG | 0.18 | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| UG/KG | 2.5 | MG/KG | 0.25 | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| UG/KG | 2.8 | MG/KG | 0.28 | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| UG/KG | 3 | MG/KG | 3 | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| - | - | MG/KG | 3.53 | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | - | - | 7.3E+00 | 1.5E+01 | - | - | 2.8E-05 | 1.1E-05 | 1.4E-05 | 1.4E-05 | - | 3.9E-05 | 2.9E-05 | - |
| Totals | | | | | | | | | | | | | | | | | | | | 4.E-01 | 3.9E-05 | 2.9E-05 | 6.8E-05 |
| MG/KG | 1300 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MG/KG | 2.6 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-04 | 2.9E-04 | 1.5E+00 | 1.6E+00 | 1.1E-01 | 2.3E-03 | 4.3E-06 | 8.7E-08 | 2.2E-06 | 1.1E-07 | 1.1E-01 | 4.4E-06 | 2.3E-06 | - |
| MG/KG | 13 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-04 | 8.0E-05 | - | - | 4.2E-01 | 4.2E-02 | - | - | - | - | 4.6E-01 | - | - | - |
| MG/KG | 66 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-03 | 6.0E-04 | - | - | 2.9E-01 | 2.9E-02 | - | - | - | - | 3.1E-01 | - | - | - |
| MG/KG | 200 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-02 | 8.0E-03 | - | - | 6.5E-02 | 6.5E-03 | - | - | - | - | 7.2E-02 | - | - | - |
| MG/KG | 390 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-02 | 1.4E-02 | - | - | 7.2E-02 | 7.2E-03 | - | - | - | - | 8.0E-02 | - | - | - |
| MG/KG | 810 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-02 | 1.4E-02 | - | - | 1.5E-01 | 1.5E-02 | - | - | - | - | 1.7E-01 | - | - | - |
| MG/KG | 12000 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-01 | 6.0E-02 | - | - | 5.2E-01 | 5.2E-02 | - | - | - | - | 5.7E-01 | - | - | - |
| MG/KG | 0.16 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | 3.0E-05 | 1.5E-05 | 1.7E+01 | 3.4E+01 | 6.9E-02 | 2.8E-02 | 3.0E-06 | 1.1E-06 | 1.5E-06 | 1.5E-06 | 9.7E-02 | 4.1E-06 | 3.0E-06 | - |
| UG/KG | 0.46 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | 5.0E-04 | 1.6E-02 | 3.5E-01 | 7.0E-01 | 1.2E-02 | 7.5E-05 | 1.8E-07 | 6.8E-08 | 9.0E-08 | 8.7E-08 | 1.2E-02 | 2.4E-07 | 1.8E-07 | - |
| UG/KG | 0.32 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | - | - | 7.3E+00 | 1.5E+01 | - | - | 2.6E-06 | 1.0E-06 | 1.3E-06 | 1.3E-06 | - | 3.6E-06 | 2.6E-06 | - |
| Totals | | | | | | | | | | | | | | | | | | | | 1.9E+00 | 1.2E-05 | 8.1E-06 | 2.0E-05 |
| MG/KG | 158 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MG/KG | 2.3 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-04 | 2.9E-04 | 1.5E+00 | 1.6E+00 | 1.0E-01 | 2.1E-03 | 3.8E-06 | 7.7E-08 | 1.9E-06 | 9.9E-08 | 1.0E-01 | 3.9E-06 | 2.0E-06 | - |
| MG/KG | 110 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-02 | 8.0E-03 | - | - | 3.6E-02 | 3.6E-03 | - | - | - | - | 3.9E-02 | - | - | - |
| MG/KG | 5550 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | 3.0E-01 | 6.0E-02 | - | - | 2.4E-01 | 2.4E-02 | - | - | - | - | 2.6E-01 | - | - | - |
| UG/KG | 0.26 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | - | - | 2.0E+00 | 4.0E+00 | - | - | 5.7E-07 | 2.2E-07 | 2.9E-07 | 2.8E-07 | - | 7.9E-07 | 5.7E-07 | - |
| UG/KG | 0.35 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | - | - | 7.3E+00 | 1.5E+01 | - | - | 2.8E-06 | 1.1E-06 | 1.4E-06 | 1.4E-06 | - | 3.9E-06 | 2.8E-06 | - |
| NG/KG | 3.96E-05 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | - | - | 1.5E+05 | 3.0E+05 | - | - | 6.5E-06 | 2.5E-06 | 3.3E-06 | 3.2E-06 | - | 9.0E-06 | 6.5E-06 | - |
| Totals | | | | | | | | | | | | | | | | | | | | 4.1E-01 | 1.8E-05 | 1.2E-05 | 3.0E-05 |

TABLE B.13.1
SURFACE SOIL SAMPLES COLLECTED IN YARDS
CANCER RISK AND HAZARD CALCULATIONS
CHILD AND ADULT
BROWN'S DUMP

| Station ID | Compound | Final Result Used | Units | EPC | Units | CPAHs -TEF | Child - | Child - | Child - | Child - | Adult - | Adult - | Referenc | Referenc | Slope Factor | Slope Factor | Child | Child | Child Risk - | Child Risk | Adult Risk - | Adult Risk | Total | Total | Total Adult | Total | |
|------------|---------------------|-------------------|-------|-----------|-------|------------|-----------|-----------|----------|----------|----------|----------|----------|----------|--------------|--------------|-----------|---------|--------------|------------|--------------|------------|---------|---------|-------------|---------|---------|
| | | | | | | | Intake - | Intake - | Intake - | Intake - | Intake - | Intake - | Dose - | Dose - | - Oral | - Dermal | Hazard - | Hazard | Ingestion | Dermal | Ingestion | Dermal | Child | Child | Ingestion | Dermal | Child |
| | | | | | | | Noncancer | Noncancer | Cancer | Cancer | Cancer | Cancer | Oral | Dermal | | | Ingestion | Dermal | | | | | Hazard | Hazard | Risk | Risk | |
| BDSB097 | LEAD | 2600 | MG/KG | 2600 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | | | | | | | | | | | | | | | |
| BDSB097 | CADMIUM | 8.7 | MG/KG | 8.7 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 5.0E-04 | 1.0E-04 | | | 2.3E-01 | 2.3E-02 | | | | | 2.5E-01 | | | | |
| BDSB097 | VANADIUM | 17 | MG/KG | 17 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-03 | 1.4E-03 | | | 3.2E-02 | 3.2E-03 | | | | | 3.5E-02 | | | | |
| BDSB097 | ARSENIC | 21 | MG/KG | 21 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-04 | 2.9E-04 | 1.5E+00 | 1.6E+00 | 9.1E-01 | 1.9E-02 | 3.5E-05 | 7.1E-07 | 1.8E-05 | 9.1E-07 | 9.3E-01 | 3.5E-05 | 1.9E-05 | | |
| BDSB097 | ANTIMONY | 22 | MG/KG | 22 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-04 | 8.0E-05 | | | 7.2E-01 | 7.2E-02 | | | | | 7.9E-01 | | | | |
| BDSB097 | CHROMIUM, TOTAL | 81 | MG/KG | 81 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-03 | 6.0E-04 | | | 3.5E-01 | 3.5E-02 | | | | | 3.9E-01 | | | | |
| BDSB097 | COPPER | 460 | MG/KG | 460 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-02 | 8.0E-03 | | | 1.5E-01 | 1.5E-02 | | | | | 1.6E-01 | | | | |
| BDSB097 | BARIUM | 740 | MG/KG | 740 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-02 | 1.4E-02 | | | 1.4E-01 | 1.4E-02 | | | | | 1.5E-01 | | | | |
| BDSB097 | MANGANESE | 760 | MG/KG | 760 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-02 | 1.4E-02 | | | 1.4E-01 | 1.4E-02 | | | | | 1.6E-01 | | | | |
| BDSB097 | IRON | 110000 | MG/KG | 110000 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-01 | 6.0E-02 | | | 4.8E+00 | 4.8E-01 | | | | | 5.2E+00 | | | | |
| BDSB097 | BENZO(a)PYRENE | 120 | UG/KG | 0.12 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | | | 7.3E+00 | 1.5E+01 | | | 9.6E-07 | 3.8E-07 | 4.9E-07 | 4.9E-07 | | 1.3E-06 | 9.8E-07 | | |
| BDSB097 | TEQ OF 2,3,7,8-TCDD | 168.7 | NG/KG | 0.0001687 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | | | 1.5E+05 | 3.0E+05 | | | 2.8E-05 | 1.1E-05 | 1.4E-05 | 1.4E-05 | | 3.8E-05 | 2.8E-05 | | |
| | | | | | | | | | | | | | | | | | | | | | | | Totals | 8.1E+00 | 7.5E-05 | 4.7E-05 | 1.2E-04 |
| BDSB045 | LEAD | 2100 | MG/KG | 2100 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | | | | | | | | | | | | | | | |
| BDSB045 | ARSENIC | 4.1 | MG/KG | 4.1 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-04 | 2.9E-04 | 1.5E+00 | 1.6E+00 | 1.8E-01 | 3.7E-03 | 6.8E-06 | 1.4E-07 | 3.4E-06 | 1.8E-07 | 1.8E-01 | 6.9E-06 | 3.6E-06 | | |
| BDSB045 | CADMIUM | 7.2 | MG/KG | 7.2 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 5.0E-04 | 1.0E-04 | | | 1.9E-01 | 1.9E-02 | | | | | 2.1E-01 | | | | |
| BDSB045 | ANTIMONY | 19 | MG/KG | 19 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-04 | 8.0E-05 | | | 6.2E-01 | 6.2E-02 | | | | | 6.8E-01 | | | | |
| BDSB045 | COPPER | 200 | MG/KG | 200 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-02 | 8.0E-03 | | | 6.5E-02 | 6.5E-03 | | | | | 7.2E-02 | | | | |
| BDSB045 | BARIUM | 500 | MG/KG | 500 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-02 | 1.4E-02 | | | 9.3E-02 | 9.3E-03 | | | | | 1.0E-01 | | | | |
| BDSB045 | IRON | 9100 | MG/KG | 9100 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-01 | 6.0E-02 | | | 3.9E-01 | 3.9E-02 | | | | | 4.3E-01 | | | | |
| BDSB045 | BENZO(a)PYRENE | 440 | UG/KG | 0.44 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | | | 7.3E+00 | 1.5E+01 | | | 3.5E-06 | 1.4E-06 | 1.8E-06 | 1.8E-06 | | 4.9E-06 | 3.6E-06 | | |
| | | | | | | | | | | | | | | | | | | | | | | | 1.7E+00 | 1.2E-05 | 7.2E-06 | 1.9E-05 | |
| BDSB101 | LEAD | 860 | MG/KG | 860 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | | | | | | | | | | | | | | | |
| BDSB101 | CADMIUM | 6.5 | MG/KG | 6.5 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 5.0E-04 | 1.0E-04 | | | 1.7E-01 | 1.7E-02 | | | | | 1.9E-01 | | | | |
| BDSB101 | ARSENIC | 8 | MG/KG | 8 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-04 | 2.9E-04 | 1.5E+00 | 1.6E+00 | 3.5E-01 | 7.2E-03 | 1.3E-05 | 2.7E-07 | 6.7E-06 | 3.5E-07 | 3.5E-01 | 1.3E-05 | 7.1E-06 | | |
| BDSB101 | ANTIMONY | 9.8 | MG/KG | 9.8 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-04 | 8.0E-05 | | | 3.2E-01 | 3.2E-02 | | | | | 3.5E-01 | | | | |
| BDSB101 | VANADIUM | 22 | MG/KG | 22 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-03 | 1.4E-03 | | | 4.1E-02 | 4.1E-03 | | | | | 4.5E-02 | | | | |
| BDSB101 | CHROMIUM, TOTAL | 39 | MG/KG | 39 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-03 | 6.0E-04 | | | 1.7E-01 | 1.7E-02 | | | | | 1.9E-01 | | | | |
| BDSB101 | COPPER | 320 | MG/KG | 320 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-02 | 8.0E-03 | | | 1.0E-01 | 1.0E-02 | | | | | 1.1E-01 | | | | |
| BDSB101 | BARIUM | 380 | MG/KG | 380 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-02 | 1.4E-02 | | | 7.1E-02 | 7.1E-03 | | | | | 7.8E-02 | | | | |
| BDSB101 | MANGANESE | 380 | MG/KG | 380 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-02 | 1.4E-02 | | | 7.1E-02 | 7.1E-03 | | | | | 7.8E-02 | | | | |
| BDSB101 | ZINC | 5100 | MG/KG | 5100 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-01 | 6.0E-02 | | | 2.2E-01 | 2.2E-02 | | | | | 2.4E-01 | | | | |
| BDSB101 | IRON | 41000 | MG/KG | 41000 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-01 | 6.0E-02 | | | 1.8E+00 | 1.8E-01 | | | | | 2.0E+00 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | 3.6E+00 | 1.3E-05 | 7.1E-06 | 2.1E-05 | |

TABLE B.13.1
SURFACE SOIL SAMPLES COLLECTED IN YARDS
CANCER RISK AND HAZARD CALCULATIONS
CHILD AND ADULT
BROWN'S DUMP

| Station ID | Compound | Final Result Used | Units | EPC | Units | CPAHs -TEF | Child - Intake - Ingestion - | Child - Intake - Dermal - | Child - Intake - Ingestion - | Child - Intake - Dermal - | Adult - Intake - Ingestion - | Adult - Intake - Dermal - | Reference Dose - Oral | Reference Dose - Dermal | Slope Factor - Oral | Slope Factor - Dermal | Child Hazard - Ingestion | Child Hazard - Dermal | Child Risk - Ingestion | Child Risk - Dermal | Adult Risk - Ingestion | Adult Risk - Dermal | Total Child Hazard | Total Child Risk | Total Adult Risk | Total Lifetime Risk |
|------------------------------|---------------------|-------------------|-------|----------|-------|------------|------------------------------|---------------------------|------------------------------|---------------------------|------------------------------|---------------------------|-----------------------|-------------------------|---------------------|-----------------------|--------------------------|-----------------------|------------------------|---------------------|------------------------|---------------------|--------------------|------------------|------------------|---------------------|
| | | | | | | | Noncancer | Noncancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer | Cancer |
| 10SB130 | LEAD | 340 | MG/KG | 340 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | | | | | | | | | | | | | | |
| 10SB130 | ANTIMONY | 3.4 | MG/KG | 3.4 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-04 | 8.0E-05 | | | 1.1E-01 | 1.1E-02 | | | | | 1.2E-01 | | | |
| 10SB130 | ARSENIC | 3.5 | MG/KG | 3.5 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-04 | 2.9E-04 | 1.5E+00 | 1.6E+00 | 1.5E-01 | 3.1E-03 | 5.8E-06 | 1.2E-07 | 2.9E-06 | 1.5E-07 | 1.5E-01 | 5.9E-06 | 3.1E-06 | |
| 10SB130 | CADMIUM | 5.1 | MG/KG | 5.1 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 5.0E-04 | 1.0E-04 | | | 1.3E-01 | 1.3E-02 | | | | | 1.5E-01 | | | |
| 10SB130 | CHROMIUM, TOTAL | 27 | MG/KG | 27 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-03 | 6.0E-04 | | | 1.2E-01 | 1.2E-02 | | | | | 1.3E-01 | | | |
| 10SB130 | BARIUM | 340 | MG/KG | 340 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-02 | 1.4E-02 | | | 6.3E-02 | 6.3E-03 | | | | | 6.9E-02 | | | |
| 10SB130 | ALUMINUM | 7900 | MG/KG | 7900 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 1.0E+00 | 2.0E-01 | | | 1.0E-01 | 1.0E-02 | | | | | 1.1E-01 | | | |
| 10SB130 | IRON | 10000 | MG/KG | 10000 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-01 | 6.0E-02 | | | 4.3E-01 | 4.3E-02 | | | | | 4.8E-01 | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.2E+005.9E-063.1E-069.0E-06 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10SB54 | LEAD | 630 | MG/KG | 630 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | | | | | | | | | | | | | | |
| 10SB54 | ANTIMONY | 7.4 | MG/KG | 7.4 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-04 | 8.0E-05 | | | 2.4E-01 | 2.4E-02 | | | | | 2.6E-01 | | | |
| 10SB54 | ARSENIC | 12 | MG/KG | 12 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-04 | 2.9E-04 | 1.5E+00 | 1.6E+00 | 5.2E-01 | 1.1E-02 | 2.0E-05 | 4.0E-07 | 1.0E-05 | 5.2E-07 | 5.3E-01 | 2.0E-05 | 1.1E-05 | |
| 10SB54 | CADMIUM | 4.3 | MG/KG | 4.3 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 5.0E-04 | 1.0E-04 | | | 1.1E-01 | 1.1E-02 | | | | | 1.2E-01 | | | |
| 10SB54 | CHROMIUM, TOTAL | 31 | MG/KG | 31 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-03 | 6.0E-04 | | | 1.3E-01 | 1.3E-02 | | | | | 1.5E-01 | | | |
| 10SB54 | BARIUM | 310 | MG/KG | 310 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-02 | 1.4E-02 | | | 5.8E-02 | 5.8E-03 | | | | | 6.3E-02 | | | |
| 10SB54 | IRON | 47000 | MG/KG | 47000 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-01 | 6.0E-02 | | | 2.0E+00 | 2.0E-01 | | | | | 2.2E+00 | | | |
| 10SB54 | VANADIUM | 16 | MG/KG | 16 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-03 | 1.4E-03 | | | 3.0E-02 | 3.0E-03 | | | | | 3.3E-02 | | | |
| 10SB54 | COPPER | 150 | MG/KG | 150 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 4.0E-02 | 8.0E-03 | | | 4.9E-02 | 4.9E-03 | | | | | 5.4E-02 | | | |
| 10SB54 | MANGANESE | 390 | MG/KG | 390 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 7.0E-02 | 1.4E-02 | | | 7.2E-02 | 7.2E-03 | | | | | 8.0E-02 | | | |
| 10SB54 | MERCURY | 15 | MG/KG | 15 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 1.0E-04 | 2.0E-05 | | | 2.0E+00 | 2.0E-01 | | | | | 2.1E+00 | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.7E+002.0E-051.1E-053.1E-05 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10SB014 | LEAD | 133 | MG/KG | 133 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | | | | | | | | | | | | | | |
| 10SB014 | ARSENIC | 3.4 | MG/KG | 3.4 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-04 | 2.9E-04 | 1.5E+00 | 1.6E+00 | 1.5E-01 | 3.0E-03 | 5.6E-06 | 1.1E-07 | 2.9E-06 | 1.5E-07 | 1.5E-01 | 5.7E-06 | 3.0E-06 | |
| 10SB014 | IRON | 6900 | MG/KG | 6900 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-01 | 6.0E-02 | | | 3.0E-01 | 3.0E-02 | | | | | 3.3E-01 | | | |
| 10SB014 | BENZO(a)PYRENE | 170 | UG/KG | 0.17 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | | | 7.3E+00 | 1.5E+01 | | | 1.4E-06 | 5.4E-07 | 6.9E-07 | 6.9E-07 | | 1.9E-06 | 1.4E-06 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.6E-017.6E-064.4E-061.2E-05 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30SB039 | LEAD | 128 | MG/KG | 158 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | | | | | | | | | | | | | | |
| 30SB039 | ARSENIC | 1.3 | MG/KG | 1.3 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-04 | 2.9E-04 | 1.5E+00 | 1.6E+00 | 5.6E-02 | 1.2E-03 | 2.1E-06 | 4.4E-08 | 1.1E-06 | 5.6E-08 | 5.7E-02 | 2.2E-06 | 1.1E-06 | |
| 30SB039 | IRON | 2600 | MG/KG | 2600 | MG/KG | | 1.3E-05 | 2.6E-07 | 1.1E-06 | 2.1E-08 | 5.6E-07 | 2.7E-08 | 3.0E-01 | 6.0E-02 | | | 1.1E-01 | 1.1E-02 | | | | | 1.2E-01 | | | |
| 30SB039 | BENZO(a)PYRENE | 170 | UG/KG | 0.17 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | | | 7.3E+00 | 1.5E+01 | | | 1.4E-06 | 5.4E-07 | 6.9E-07 | 6.9E-07 | | 1.9E-06 | 1.4E-06 | |
| 30SB039 | TEQ OF 2,3,7,8-TCDD | 27.7 | NG/KG | 2.77E-05 | MG/KG | | 1.3E-05 | 2.6E-06 | 1.1E-06 | 2.1E-07 | 5.6E-07 | 2.7E-07 | | | 1.5E+05 | 3.0E+05 | | | 4.6E-06 | 1.7E-06 | 2.3E-06 | 2.2E-06 | | 6.3E-06 | 4.6E-06 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.8E-011.0E-057.1E-061.8E-05 | | | | | | | | | | | | | | | | | | | | | | | | | | |

EXAMPLE CALCULATION

(H'E)/N E'I)/OG'J*PG*K'QG*L'P *M*Q R+S T+U V+W

SUM(X15 + X2 M(Y15 + Y2 M(Z15 + Z2 M(Y24+ Z24

APPENDIX C

Comparison Data for 296 Surface Soil Samples from Residential Areas

Appendix C

Comparison Data for 296 Surface Soil Samples from Residential Areas

As discussed in Appendix B, 306 surface soil samples were collected from the residential areas of the Brown's Dump site. However, it was not feasible to calculate risks for 306 exposure units; therefore, 296 surface soil sample locations were not included in the quantitative evaluation. Based on the reduced numbers of COPCs at these 296 locations, it was anticipated that the total risk and hazard at each location would be less than the criteria of concern (i.e., cancer risk of $1\text{E-}04$ or HI of 1). However, the analytical data from each of these 296 locations were evaluated qualitatively by comparing the detected concentration of each COPC to its chemical-specific RGO. If the detected concentration of a chemical was greater than the RGO corresponding to an HQ of 1 or a cancer risk of $1\text{E-}06$, then further action may be required at that sample location (e.g., additional sampling, soil removal). It should be noted that EPA Region 4 has established that a residential cleanup goal around 20 mg/kg is protective for all toxic manifestations of arsenic in surface soil. Therefore, a RGO of 23 mg/kg (see Table 12.1) was selected for comparison with detected concentrations of arsenic. This concentration corresponds to a HI of 1 for a child resident. Also, EPA's OSWER directive establishes a cleanup goal of 1 $\mu\text{g/kg}$ for dioxin in residential soil. Therefore, a RGO of 1 $\mu\text{g/kg}$ was selected for comparison with detected concentrations of dioxin. A comprehensive list of RGOs is presented in Tables B.11.1 and B.11.2.

The comparison of the analytical data from the 296 surface soil samples to the corresponding chemical-specific RGOs is included in Table C.1. Detected concentrations of COPCs in 266 of the 296 samples were all below RGOs. However, a total of 30 surface soil samples contained COPC concentrations that exceeded at least one RGO. Lead was the only contaminant of concern in 26 samples (i.e., lead was the only COPC detected at a concentration that exceeded an RGO). Lead and CPAHs were detected in sample BDSB058 at concentrations that exceeded their respective RGOs. Two surface soil samples (BDSB071 and BDSB340) contained detected concentrations of CPAHs that exceeded the RGO (lead was detected at concentrations less than 400 mg/kg in these two samples). One surface soil sample, BDSB104, contained a detected concentration of arsenic that exceeded its RGO.

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|-----------------|-------|-------|-----------|-----|--------|
| BDSB001 | Lead | 134 | mg/kg | | 400 | NO |
| BDSB002 | Lead | 47 | mg/kg | | 400 | NO |
| BDSB003 | Lead | 126 | mg/kg | | 400 | NO |
| BDSB004 | Lead | 1,270 | mg/kg | | 400 | YES |
| BDSB005 | Lead | 69.6 | mg/kg | | 400 | NO |
| BDSB006 | Lead | 40 | mg/kg | | 400 | NO |
| BDSB007 | Lead | 4,000 | mg/kg | | 400 | YES |
| BDSB008 | Lead | 130 | mg/kg | | 400 | NO |
| BDSB008 | Arsenic | 0.66 | mg/kg | | 23 | NO |
| BDSB010 | Lead | 421 | mg/kg | | 400 | YES |
| BDSB011 | Lead | 1,700 | mg/kg | | 400 | YES |
| BDSB013 | Lead | 39 | mg/kg | | 400 | NO |
| BDSB015 | Lead | 64.1 | mg/kg | | 400 | NO |
| BDSB016 | Lead | 195 | mg/kg | | 400 | NO |
| BDSB016 | Arsenic | 6.7 | mg/kg | | 23 | NO |
| BDSB016 | Vanadium | 20 | mg/kg | | 430 | NO |
| BDSB016 | Chromium, Total | 27 | mg/kg | | 211 | NO |
| BDSB017 | Lead | 76.6 | mg/kg | | 400 | NO |
| BDSB018 | Lead | 53 | mg/kg | | 400 | NO |
| BDSB019 | Lead | 52 | mg/kg | | 400 | NO |
| BDSB020 | Lead | 100 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|----------|-------|-------|-----------|-----|--------|
| BDSB021 | Lead | 43.6 | mg/kg | | 400 | NO |
| BDSB022 | Lead | 21.2 | mg/kg | | 400 | NO |
| BDSB023 | Lead | 32.8 | mg/kg | | 400 | NO |
| BDSB024 | Lead | 50 | mg/kg | | 400 | NO |
| BDSB026 | Lead | 634 | mg/kg | | 400 | YES |
| BDSB027 | Lead | 20.9 | mg/kg | | 400 | NO |
| BDSB028 | Lead | 4,300 | mg/kg | | 400 | YES |
| BDSB029 | Lead | 646 | mg/kg | | 400 | YES |
| BDSB030 | Lead | 463 | mg/kg | | 400 | YES |
| BDSB031 | Lead | 210 | mg/kg | | 400 | NO |
| BDSB030 | Lead | 93 | mg/kg | | 400 | NO |
| BDSB032 | Lead | 21.8 | mg/kg | | 400 | NO |
| BDSB033 | Lead | 47.4 | mg/kg | | 400 | NO |
| BDSB034 | Lead | 17.5 | mg/kg | | 400 | NO |
| BDSB034 | Arsenic | 0.59 | mg/kg | | 23 | NO |
| BDSB035 | Lead | 114 | mg/kg | | 400 | NO |
| BDSB035 | Arsenic | 0.97 | mg/kg | | 23 | NO |
| BDSB036 | Lead | 77 | mg/kg | | 400 | NO |
| BDSB036 | Arsenic | 0.62 | mg/kg | | 23 | NO |
| BDSB037 | Lead | 16 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|-----------|------|-------|-----------|-------|--------|
| BDSB038 | Lead | 24.3 | mg/kg | | 400 | NO |
| BDSB040 | Lead | 104 | mg/kg | | 400 | NO |
| BDSB040 | Arsenic | 3.5 | mg/kg | | 23 | NO |
| BDSB040 | Vanadium | 18 | mg/kg | | 430 | NO |
| BDSB040 | Manganese | 290 | mg/kg | | 4,790 | NO |
| BDSB041 | Lead | 127 | mg/kg | | 400 | NO |
| BDSB041 | Arsenic | 7.4 | mg/kg | | 23 | NO |
| BDSB041 | Vanadium | 18.1 | mg/kg | | 430 | NO |
| BDSB041 | Manganese | 218 | mg/kg | | 4,790 | NO |
| BDSB042 | Lead | 83 | mg/kg | | 400 | NO |
| BDSB042 | Arsenic | 1.2 | mg/kg | | 23 | NO |
| BDSB043 | Lead | 51 | mg/kg | | 400 | NO |
| BDSB043 | Arsenic | 0.95 | mg/kg | | 23 | NO |
| BDSB044 | Lead | 25 | mg/kg | | 400 | NO |
| BDSB044 | Arsenic | 0.75 | mg/kg | | 23 | NO |
| BDSB046 | Lead | 240 | mg/kg | | 400 | NO |
| BDSB046 | Arsenic | 1.8 | mg/kg | | 23 | NO |
| BDSB046 | Barium | 150 | mg/kg | | 4,960 | NO |
| BDSB047 | Lead | 69.3 | mg/kg | | 400 | NO |
| BDSB048 | Lead | 42 | mg/kg | | 400 | NO |
| BDSB049 | Lead | 445 | mg/kg | | 400 | YES |
| BDSB050 | Lead | 135 | mg/kg | | 400 | NO |
| BDSB051 | Lead | 45 | mg/kg | | 400 | NO |
| BDSB052 | Lead | 122 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|----------------------|-------|-------|-----------|------|--------|
| BDSB053 | Lead | 89.7 | mg/kg | | 400 | NO |
| BDSB055 | Lead | 840 | mg/kg | | 400 | YES |
| BDSB056 | Lead | 100 | mg/kg | | 400 | NO |
| BDSB057 | Lead | 45 | mg/kg | | 400 | NO |
| BDSB058 | Lead | 710 | mg/kg | | 400 | YES |
| BDSB058 | Arsenic | 2.1 | mg/kg | | 23 | NO |
| BDSB058 | Benzo(a)pyrene | 0.640 | mg/kg | 0.640 | | |
| BDSB058 | Benzo(b)fluoranthene | 0.700 | mg/kg | 0.070 | | |
| BDSB058 | TEF CPAHs | -- | mg/kg | 0.710 | 0.07 | YES |
| BDSB059 | Lead | 107 | mg/kg | | 400 | NO |
| BDSB060 | Lead | 306 | mg/kg | | 400 | NO |
| BDSB061 | Lead | 34 | mg/kg | | 400 | NO |
| BDSB062 | Lead | 69.1 | mg/kg | | 400 | NO |
| BDSB063 | Lead | 216 | mg/kg | | 400 | NO |
| BDSB063 | Arsenic | 2 | mg/kg | | 23 | NO |
| BDSB064 | Lead | 550 | mg/kg | | 400 | YES |
| BDSB064 | Arsenic | 0.53 | mg/kg | | 23 | NO |
| BDSB065 | Lead | 155 | mg/kg | | 400 | NO |
| BDSB066 | Lead | 100 | mg/kg | | 400 | NO |
| BDSB066 | Arsenic | 1.1 | mg/kg | | 23 | NO |
| BDSB067 | Lead | 60.4 | mg/kg | | 400 | NO |
| BDSB069 | Lead | 165 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|----------------|-----------------------|-------------|--------------|--------------|-------------|------------|
| BDSB070 | Lead | 18 | mg/kg | | 400 | NO |
| BDSB070 | Arsenic | 0.56 | mg/kg | | 23 | NO |
| BDSB071 | Lead | 44 | mg/kg | | 400 | NO |
| BDSB071 | Arsenic | 0.81 | mg/kg | | 23 | NO |
| BDSB071 | Dibenz(a,h)anthracene | 0.079 | mg/kg | 0.079 | | |
| BDSB071 | Benzo(a)pyrene | 0.260 | mg/kg | 0.260 | | |
| BDSB071 | TEF CPAHs | -- | mg/kg | 0.339 | 0.07 | YES |
| BDSB071 | Dioxin | 0.0000039 | mg/kg | | 0.001 | NO |
| BDSB072 | Lead | 94 | mg/kg | | 400 | NO |
| BDSB073 | Lead | 113 | mg/kg | | 400 | NO |
| BDSB073 | Arsenic | 1.4 | mg/kg | | 23 | NO |
| BDSB074 | Lead | 52.7 | mg/kg | | 400 | NO |
| BDSB075 | Lead | 160 | mg/kg | | 400 | NO |
| BDSB076 | Lead | 439 | mg/kg | | 400 | YES |
| BDSB077 | Lead | 205 | mg/kg | | 400 | NO |
| BDSB077 | Arsenic | 1 | mg/kg | | 23 | NO |
| BDSB078 | Lead | 96 | mg/kg | | 400 | NO |
| BDSB078 | Arsenic | 1.15 | mg/kg | | 23 | NO |
| BDSB079 | Lead | 204 | mg/kg | | 400 | NO |
| BDSB079 | Dioxin | 0.00000066 | mg/kg | | 0.001 | NO |
| BDSB081 | Lead | 890 | mg/kg | | 400 | YES |
| BDSB083 | Lead | 231 | mg/kg | | 400 | NO |
| BDSB084 | Lead | 1520 | mg/kg | | 400 | YES |
| BDSB085 | Lead | 360 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|----------|-----------|-------|-----------|-------|--------|
| BDSB086 | Lead | 39.5 | mg/kg | | 400 | NO |
| BDSB087 | Lead | 46.3 | mg/kg | | 400 | NO |
| BDSB088 | Lead | 127 | mg/kg | | 400 | NO |
| BDSB088 | Arsenic | 1.2 | mg/kg | | 23 | NO |
| BDSB088 | Dioxin | 0.0000025 | mg/kg | | 0.001 | NO |
| BDSB089 | Lead | 99.9 | mg/kg | | 400 | NO |
| BDSB090 | Lead | 23.4 | mg/kg | | 400 | NO |
| BDSB090 | Arsenic | 1.2 | mg/kg | | 23 | NO |
| BDSB091 | Lead | 44.9 | mg/kg | | 400 | NO |
| BDSB092 | Lead | 355 | mg/kg | | 400 | NO |
| BDSB093 | Lead | 185 | mg/kg | | 400 | NO |
| BDSB094 | Lead | 1,520 | mg/kg | | 400 | YES |
| BDSB095 | Lead | 82.7 | mg/kg | | 400 | NO |
| BDSB096 | Lead | 178 | mg/kg | | 400 | NO |
| BDSB098 | Lead | 812 | mg/kg | | 400 | YES |
| BDSB099 | Lead | 399 | mg/kg | | 400 | NO |
| BDSB100 | Lead | 864 | mg/kg | | 400 | YES |
| BDSB102 | Lead | 253 | mg/kg | | 400 | NO |
| BDSB103 | Lead | 490 | mg/kg | | 400 | YES |
| BDSB104 | Lead | 40 | mg/kg | | 400 | NO |
| BDSB104 | Arsenic | 105 | mg/kg | | 23 | YES |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|----------|-----------|-------|-----------|-------|--------|
| BDSB105 | Lead | 342 | mg/kg | | 400 | NO |
| BDSB106 | Lead | 149 | mg/kg | | 400 | NO |
| BDSB107 | Lead | 84.7 | mg/kg | | 400 | NO |
| BDSB108 | Lead | 132 | mg/kg | | 400 | NO |
| BDSB108 | Arsenic | 1.3 | mg/kg | | 23 | NO |
| BDSB109 | Lead | 65 | mg/kg | | 400 | NO |
| BDSB109 | Arsenic | 1.6 | mg/kg | | 23 | NO |
| BDSB110 | Lead | 153 | mg/kg | | 400 | NO |
| BDSB110 | Arsenic | 0.83 | mg/kg | | 23 | NO |
| BDSB111 | Lead | 66.5 | mg/kg | | 400 | NO |
| BDSB112 | Lead | 22.6 | mg/kg | | 400 | NO |
| BDSB113 | Lead | 17.1 | mg/kg | | 400 | NO |
| BDSB113 | Arsenic | 1.5 | mg/kg | | 23 | NO |
| BDSB113 | Dioxin | 0.0000003 | mg/kg | | 0.001 | NO |
| BDSB114 | Lead | 30.5 | mg/kg | | 400 | NO |
| BDSB115 | Lead | 71.7 | mg/kg | | 400 | NO |
| BDSB116 | Lead | 80 | mg/kg | | 400 | NO |
| BDSB116 | Arsenic | 1.5 | mg/kg | | 23 | NO |
| BDSB117 | Lead | 63.5 | mg/kg | | 400 | NO |
| BDSB118 | Lead | 47 | mg/kg | | 400 | NO |
| BDSB120 | Lead | 49.3 | mg/kg | | 400 | NO |
| BDSB121 | Lead | 44 | mg/kg | | 400 | NO |
| BDSB122 | Lead | 44 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|-----------------|------|-------|-----------|-------|--------|
| BDSB124 | Lead | 170 | mg/kg | | 400 | NO |
| BDSB124 | Arsenic | 4.7 | mg/kg | | 23 | NO |
| BDSB124 | Copper | 280 | mg/kg | | 2,810 | NO |
| BDSB126 | Lead | 43 | mg/kg | | 400 | NO |
| BDSB127 | Lead | 130 | mg/kg | | 400 | NO |
| BDSB127 | Arsenic | 2.2 | mg/kg | | 23 | NO |
| BDSB128 | Lead | 51.9 | mg/kg | | 400 | NO |
| BDSB129 | Lead | 259 | mg/kg | | 400 | NO |
| BDSB131 | Lead | 106 | mg/kg | | 400 | NO |
| BDSB132 | Lead | 42 | mg/kg | | 400 | NO |
| BDSB133 | Lead | 94.8 | mg/kg | | 400 | NO |
| BDSB134 | Lead | 740 | mg/kg | | 400 | YES |
| BDSB134 | Antimony | 5.5 | mg/kg | | 29 | NO |
| BDSB134 | Arsenic | 5.7 | mg/kg | | 23 | NO |
| BDSB134 | Copper | 110 | mg/kg | | 2,810 | NO |
| BDSB134 | Barium | 150 | mg/kg | | 4,960 | NO |
| BDSB134 | Manganese | 220 | mg/kg | | 4,790 | NO |
| BDSB135 | Lead | 249 | mg/kg | | 400 | NO |
| BDSB136 | Lead | 320 | mg/kg | | 400 | NO |
| BDSB136 | Arsenic | 3.6 | mg/kg | | 23 | NO |
| BDSB136 | Chromium, Total | 25 | mg/kg | | 211 | NO |
| BDSB136 | Copper | 120 | mg/kg | | 2,810 | NO |
| BDSB136 | Barium | 200 | mg/kg | | 4,960 | NO |
| BDSB136 | Manganese | 230 | mg/kg | | 4,790 | NO |
| BDSB137 | Lead | 185 | mg/kg | | 400 | NO |
| BDSB138 | Lead | 146 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|----------|------|-------|-----------|-----|--------|
| BDSB139 | Lead | 69.5 | mg/kg | | 400 | NO |
| BDSB140 | Lead | 46 | mg/kg | | 400 | NO |
| BDSB141 | Lead | 86.8 | mg/kg | | 400 | NO |
| BDSB142 | Lead | 50.1 | mg/kg | | 400 | NO |
| BDSB142 | Arsenic | 1.2 | mg/kg | | 23 | NO |
| BDSB143 | Lead | 212 | mg/kg | | 400 | NO |
| BDSB144 | Lead | 36.6 | mg/kg | | 400 | NO |
| BDSB145 | Lead | 339 | mg/kg | | 400 | NO |
| BDSB146 | Lead | 64.2 | mg/kg | | 400 | NO |
| BDSB146 | Arsenic | 0.52 | mg/kg | | 23 | NO |
| BDSB147 | Lead | 84.5 | mg/kg | | 400 | NO |
| BDSB147 | Arsenic | 1.4 | mg/kg | | 23 | NO |
| BDSB148 | Lead | 98.2 | mg/kg | | 400 | NO |
| BDSB148 | Arsenic | 1.3 | mg/kg | | 23 | NO |
| BDSB149 | Lead | 89 | mg/kg | | 400 | NO |
| BDSB149 | Arsenic | 1.9 | mg/kg | | 23 | NO |
| BDSB150 | Lead | 55.4 | mg/kg | | 400 | NO |
| BDSB151 | Lead | 28.4 | mg/kg | | 400 | NO |
| BDSB151 | Arsenic | 1.3 | mg/kg | | 23 | NO |
| BDSB152 | Lead | 73 | mg/kg | | 400 | NO |
| BDSB152 | Arsenic | 8.2 | mg/kg | | 23 | NO |
| BDSB153 | Lead | 131 | mg/kg | | 400 | NO |
| BDSB154 | Lead | 51.2 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|-----------------------|-----------|-------|-----------|-------|--------|
| BDSB155 | Lead | 53.1 | mg/kg | | 400 | NO |
| BDSB156 | Lead | 55 | mg/kg | | 400 | NO |
| BDSB157 | Lead | 49.4 | mg/kg | | 400 | NO |
| BDSB157 | Arsenic | 0.86 | mg/kg | | 23 | NO |
| BDSB157 | Dibenz(a,h)anthracene | 0.067 | mg/kg | 0.067 | | |
| BDSB157 | TEF CPAHs | — | mg/kg | 0.067 | 0.07 | NO |
| BDSB157 | Dioxin | 0.0000015 | mg/kg | | 0.001 | NO |
| BDSB158 | Lead | 27.7 | mg/kg | | 400 | NO |
| BDSB159 | Lead | 51.5 | mg/kg | | 400 | NO |
| BDSB160 | Lead | 52.6 | mg/kg | | 400 | NO |
| BDSB161 | Lead | 102 | mg/kg | | 400 | NO |
| BDSB161 | Arsenic | 0.67 | mg/kg | | 23 | NO |
| BDSB162 | Lead | 34.1 | mg/kg | | 400 | NO |
| BDSB163 | Lead | 58 | mg/kg | | 400 | NO |
| BDSB163 | Arsenic | 0.89 | mg/kg | | 23 | NO |
| BDSB164 | Lead | 36.9 | mg/kg | | 400 | NO |
| BDSB165 | Lead | 59.7 | mg/kg | | 400 | NO |
| BDSB166 | Lead | 48.5 | mg/kg | | 400 | NO |
| BDSB166 | Arsenic | 2.6 | mg/kg | | 23 | NO |
| BDSB167 | Lead | 42.6 | mg/kg | | 400 | NO |
| BDSB167 | Arsenic | 0.52 | mg/kg | | 23 | NO |
| BDSB168 | Lead | 60.5 | mg/kg | | 400 | NO |
| BDSB169 | Lead | 48.1 | mg/kg | | 400 | NO |
| BDSB170 | Lead | 79 | mg/kg | | 400 | NO |
| BDSB170 | Arsenic | 2.8 | mg/kg | | 23 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|----------|-------|-------|-----------|-------|--------|
| BDSB171 | Lead | 38.3 | mg/kg | | 400 | NO |
| BDSB172 | Lead | 35.9 | mg/kg | | 400 | NO |
| BDSB173 | Lead | 75.2 | mg/kg | | 400 | NO |
| BDSB174 | Lead | 35.9 | mg/kg | | 400 | NO |
| BDSB175 | Lead | 57.1 | mg/kg | | 400 | NO |
| BDSB176 | Lead | 25.4 | mg/kg | | 400 | NO |
| BDSB177 | Lead | 81 | mg/kg | | 400 | NO |
| BDSB177 | Arsenic | 0.73 | mg/kg | | 23 | NO |
| BDSB178 | Lead | 99 | mg/kg | | 400 | NO |
| BDSB178 | Arsenic | 1.4 | mg/kg | | 23 | NO |
| BDSB179 | Lead | 15 | mg/kg | | 400 | NO |
| BDSB180 | Lead | 160 | mg/kg | | 400 | NO |
| BDSB180 | Arsenic | 2.5 | mg/kg | | 23 | NO |
| BDSB180 | Barium | 110 | mg/kg | | 4,960 | NO |
| BDSB181 | Lead | 100 | mg/kg | | 400 | NO |
| BDSB181 | Arsenic | 1 | mg/kg | | 23 | NO |
| BDSB183 | Lead | 462 | mg/kg | | 400 | YES |
| BDSB184 | Lead | 194 | mg/kg | | 400 | NO |
| BDSB185 | Lead | 122.9 | mg/kg | | 400 | NO |
| BDSB185 | Arsenic | 0.63 | mg/kg | | 23 | NO |
| BDSB186 | Lead | 235 | mg/kg | | 400 | NO |
| BDSB186 | Arsenic | 1.2 | mg/kg | | 23 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|-----------------|------|-------|-----------|-------|--------|
| BDSB187 | Lead | 38 | mg/kg | | 400 | NO |
| BDSB187 | Arsenic | 0.58 | mg/kg | | 23 | NO |
| BDSB188 | Lead | 73.3 | mg/kg | | 400 | NO |
| BDSB189 | Lead | 580 | mg/kg | | 400 | YES |
| BDSB189 | Arsenic | 1.5 | mg/kg | | 23 | NO |
| BDSB189 | Chromium, Total | 31 | mg/kg | | 211 | NO |
| BDSB189 | Barium | 140 | mg/kg | | 4,960 | NO |
| BDSB190 | Lead | 31.8 | mg/kg | | 400 | NO |
| BDSB191 | Lead | 41 | mg/kg | | 400 | NO |
| BDSB192 | Lead | 228 | mg/kg | | 400 | NO |
| BDSB192 | Arsenic | 0.82 | mg/kg | | 23 | NO |
| BDSB193 | Lead | 506 | mg/kg | | 400 | YES |
| BDSB194 | Lead | 45 | mg/kg | | 400 | NO |
| BDSB300 | Lead | 48.8 | mg/kg | | 400 | NO |
| BDSB301 | Lead | 475 | mg/kg | | 400 | YES |
| BDSB302 | Lead | 46.7 | mg/kg | | 400 | NO |
| BDSB303 | Lead | 63.8 | mg/kg | | 400 | NO |
| BDSB304 | Lead | 97 | mg/kg | | 400 | NO |
| BDSB304 | Arsenic | 1.3 | mg/kg | | 23 | NO |
| BDSB305 | Lead | 43.7 | mg/kg | | 400 | NO |
| BDSB306 | Lead | 86 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|-----------|------|-------|-----------|-------|--------|
| BDSB307 | Lead | 150 | mg/kg | | 400 | NO |
| BDSB307 | Arsenic | 4.6 | mg/kg | | 23 | NO |
| BDSB307 | Manganese | 370 | mg/kg | | 4,790 | NO |
| BDSB308 | Lead | 40.1 | mg/kg | | 400 | NO |
| BDSB309 | Lead | 106 | mg/kg | | 400 | NO |
| BDSB310 | Lead | 55.1 | mg/kg | | 400 | NO |
| BDSB310 | Arsenic | 0.47 | mg/kg | | 23 | NO |
| BDSB311 | Lead | 185 | mg/kg | | 400 | NO |
| BDSB311 | Arsenic | 1.2 | mg/kg | | 23 | NO |
| BDSB312 | Lead | 79.9 | mg/kg | | 400 | NO |
| BDSB313 | Lead | 17 | mg/kg | | 400 | NO |
| BDSB314 | Lead | 82.6 | mg/kg | | 400 | NO |
| BDSB315 | Lead | 47.7 | mg/kg | | 400 | NO |
| BDSB315 | Arsenic | 0.52 | mg/kg | | 23 | NO |
| BDSB316 | Lead | 241 | mg/kg | | 400 | NO |
| BDSB317 | Lead | 188 | mg/kg | | 400 | NO |
| BDSB317 | Arsenic | 0.75 | mg/kg | | 23 | NO |
| BDSB318 | Lead | 38.9 | mg/kg | | 400 | NO |
| BDSB319 | Lead | 665 | mg/kg | | 400 | YES |
| BDSB320 | Lead | 19.1 | mg/kg | | 400 | NO |
| BDSB321 | Lead | 21.7 | mg/kg | | 400 | NO |
| BDSB322 | Lead | 33.4 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|----------|------|-------|-----------|-----|--------|
| BDSB323 | Lead | 51 | mg/kg | | 400 | NO |
| BDSB324 | Lead | 27.5 | mg/kg | | 400 | NO |
| BDSB325 | Lead | 31.8 | mg/kg | | 400 | NO |
| BDSB326 | Lead | 64.3 | mg/kg | | 400 | NO |
| BDSB327 | Lead | 33.2 | mg/kg | | 400 | NO |
| BDSB328 | Lead | 149 | mg/kg | | 400 | NO |
| BDSB329 | Lead | 87.5 | mg/kg | | 400 | NO |
| BDSB330 | Lead | 30.4 | mg/kg | | 400 | NO |
| BDSB331 | Lead | 34.5 | mg/kg | | 400 | NO |
| BDSB332 | Lead | 23.9 | mg/kg | | 400 | NO |
| BDSB333 | Lead | 28.9 | mg/kg | | 400 | NO |
| BDSB334 | Lead | 58.7 | mg/kg | | 400 | NO |
| BDSB335 | Lead | 58.1 | mg/kg | | 400 | NO |
| BDSB336 | Lead | 144 | mg/kg | | 400 | NO |
| BDSB337 | Lead | 139 | mg/kg | | 400 | NO |
| BDSB338 | Lead | 51.7 | mg/kg | | 400 | NO |
| BDSB339 | Lead | 21.9 | mg/kg | | 400 | NO |
| BDSB339 | Arsenic | 1.1 | mg/kg | | 23 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|----------------|------------------|-------------|--------------|--------------|-------------|------------|
| BDSB340 | Lead | 32.5 | mg/kg | | 400 | NO |
| BDSB340 | Arsenic | 0.9 | mg/kg | | 23 | NO |
| BDSB340 | Benzo(a)pyrene | 0.099 | mg/kg | 0.099 | | |
| BDSB340 | TEF CPAHs | -- | mg/kg | 0.099 | 0.07 | YES |
| BDSB340 | Dioxin | 0.0000022 | mg/kg | | 0.001 | NO |
| BDSB341 | Lead | 1590 | mg/kg | | 400 | YES |
| BDSB342 | Lead | 35.1 | mg/kg | | 400 | NO |
| BDSB343 | Lead | 64.7 | mg/kg | | 400 | NO |
| BDSB344 | Lead | 546 | mg/kg | | 400 | YES |
| BDSB345 | Lead | 38.9 | mg/kg | | 400 | NO |
| BDSB345 | Arsenic | 0.72 | mg/kg | | 23 | NO |
| BDSB346 | Lead | 43.8 | mg/kg | | 400 | NO |
| BDSB346 | Arsenic | 1.2 | mg/kg | | 23 | NO |
| BDSB347 | Lead | 33.6 | mg/kg | | 400 | NO |
| BDSB347 | Dioxin | 0.000001 | mg/kg | | 0.001 | NO |
| BDSB348 | Lead | 27.6 | mg/kg | | 400 | NO |
| BDSB349 | Lead | 29.4 | mg/kg | | 400 | NO |
| BDSB350 | Lead | 30 | mg/kg | | 400 | NO |
| BDSB351 | Lead | 25.6 | mg/kg | | 400 | NO |
| BDSB352 | Lead | 29 | mg/kg | | 400 | NO |
| BDSB353 | Lead | 30.3 | mg/kg | | 400 | NO |
| BDSB354 | Lead | 46.1 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|----------|------|-------|-----------|-----|--------|
| BDSB355 | Lead | 32 | mg/kg | | 400 | NO |
| BDSB356 | Lead | 38.5 | mg/kg | | 400 | NO |
| BDSB357 | Lead | 13 | mg/kg | | 400 | NO |
| BDSB358 | Lead | 12 | mg/kg | | 400 | NO |
| BDSB359 | Lead | 23 | mg/kg | | 400 | NO |
| BDSB360 | Lead | 18 | mg/kg | | 400 | NO |
| BDSB361 | Lead | 15 | mg/kg | | 400 | NO |
| BDSB362 | Lead | 17 | mg/kg | | 400 | NO |
| BDSB364 | Lead | 16 | mg/kg | | 400 | NO |
| BDSB365 | Lead | 9.1 | mg/kg | | 400 | NO |
| BDSB366 | Lead | 10 | mg/kg | | 400 | NO |
| BDSB367 | Lead | 12 | mg/kg | | 400 | NO |
| BDSB368 | Lead | 16 | mg/kg | | 400 | NO |
| BDSB369 | Lead | 14 | mg/kg | | 400 | NO |
| BDSB370 | Lead | 55.8 | mg/kg | | 400 | NO |
| BDSB371 | Lead | 20 | mg/kg | | 400 | NO |
| BDSB372 | Lead | 35.6 | mg/kg | | 400 | NO |
| BDSB373 | Lead | 31.4 | mg/kg | | 400 | NO |
| BDSB374 | Lead | 17 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|----------|------|-------|-----------|-----|--------|
| BDSB375 | Lead | 48.3 | mg/kg | | 400 | NO |
| BDSB376 | Lead | 11 | mg/kg | | 400 | NO |
| BDSB377 | Lead | 13 | mg/kg | | 400 | NO |
| BDSB378 | Lead | 21.6 | mg/kg | | 400 | NO |
| BDSB379 | Lead | 12 | mg/kg | | 400 | NO |
| BDSB380 | Lead | 15 | mg/kg | | 400 | NO |
| BDSB381 | Lead | 17.1 | mg/kg | | 400 | NO |
| BDSB382 | Lead | 10 | mg/kg | | 400 | NO |
| BDSB383 | Lead | 21 | mg/kg | | 400 | NO |
| BDSB384 | Lead | 20 | mg/kg | | 400 | NO |
| BDSB385 | Lead | 11 | mg/kg | | 400 | NO |
| BDSB386 | Lead | 21 | mg/kg | | 400 | NO |
| BDSB387 | Lead | 38 | mg/kg | | 400 | NO |
| BDSB388 | Lead | 70.1 | mg/kg | | 400 | NO |
| BDSB389 | Lead | 43 | mg/kg | | 400 | NO |
| BDSB390 | Lead | 41.7 | mg/kg | | 400 | NO |
| BDSB391 | Lead | 46 | mg/kg | | 400 | NO |
| BDSB392 | Lead | 22.1 | mg/kg | | 400 | NO |
| BDSB393 | Lead | 29.7 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|----------|------|-------|-----------|-----|--------|
| BDSB394 | Lead | 32 | mg/kg | | 400 | NO |
| BDSB395 | Lead | 41.1 | mg/kg | | 400 | NO |
| BDSB396 | Lead | 195 | mg/kg | | 400 | NO |
| BDSB397 | Lead | 56 | mg/kg | | 400 | NO |
| BDSB398 | Lead | 12 | mg/kg | | 400 | NO |
| BDSB399 | Lead | 44 | mg/kg | | 400 | NO |
| BDSB400 | Lead | 19.1 | mg/kg | | 400 | NO |
| BDSB401 | Lead | 44.8 | mg/kg | | 400 | NO |
| BDSB402 | Lead | 47 | mg/kg | | 400 | NO |
| BDSB403 | Lead | 17 | mg/kg | | 400 | NO |
| BDSB404 | Lead | 38.2 | mg/kg | | 400 | NO |
| BDSB405 | Lead | 47 | mg/kg | | 400 | NO |
| BDSB406 | Lead | 55.2 | mg/kg | | 400 | NO |
| BDSB407 | Lead | 40.3 | mg/kg | | 400 | NO |
| BDSB408 | Lead | 76.5 | mg/kg | | 400 | NO |
| BDSB409 | Lead | 40 | mg/kg | | 400 | NO |
| BDSB410 | Lead | 99.7 | mg/kg | | 400 | NO |
| BDSB411 | Lead | 319 | mg/kg | | 400 | NO |

Table C.1
Results For Residential Areas Compared To RGOs
Brown's Dump Site
Jacksonville, Duval County, Florida

| ID | Compound | EPC | Units | CPAHs-TEF | RGO | Exceed |
|---------|----------|------|-------|-----------|-----|--------|
| BDSB412 | Lead | 68.7 | mg/kg | | 400 | NO |
| BDSB413 | Lead | 224 | mg/kg | | 400 | NO |
| BDSB414 | Lead | 338 | mg/kg | | 400 | NO |
| BDSB415 | Lead | 191 | mg/kg | | 400 | NO |
| BDSB416 | Lead | 79.1 | mg/kg | | 400 | NO |
| BDSB417 | Lead | 43.5 | mg/kg | | 400 | NO |
| BDSB418 | Lead | 66 | mg/kg | | 400 | NO |

APPENDIX D
Toxicity Profiles

Appendix D

Chemical-Specific Toxicity Assessments for Chemicals of Concern

Health Effects of Chemicals of Potential Concern

This subsection contains chemical-specific information on the adverse health effects that are caused by each chemical of potential concern at the site.

Inorganics

Aluminum: Aluminum is a tin-white, malleable, ductile metal with a somewhat bluish tint; capable of taking on a brilliant shine which is retained in dry air. In moist air, an oxide film forms which protects the metal from corrosion. Aluminum is the third most abundant of all elements on earth.

No information on the environmental toxicology of aluminum could be located in the literature; however, there are data on the industrial exposure to aluminum via the inhalation route. From industrial toxicologic information, there would appear to be a need for different allowable exposure levels based on the form of aluminum in the air. Metal dusts have been assigned an allowable exposure limit of 5 mg Al/m³. Soluble salts and aluminum alkyl compounds have been assigned an allowable exposure limit of 2 mg AL/m³.

Antimony: Antimony is a naturally occurring metal that is used in various manufacturing processes. It exists in valence states of 3 and 5 (Budavari, 1989; ATSDR, 1990). Antimony is transported in the blood, its distribution varying among species and dependent on its valence state (Felicetti et al., 1974b). It is not metabolized but may bind to macromolecules and react covalently with sulfhydryl and phosphate groups (ATSDR, 1990).

Acute oral exposure of humans and animals to high doses of antimony or antimony-containing compounds (antimonials) may cause gastrointestinal disorders (vomiting, diarrhea), respiratory difficulties, and death at extremely high doses (Bradley and Frederick, 1941; Beliles, 1979; ATSDR, 1990). Subchronic and chronic oral exposure may affect hematologic parameters (ATSDR, 1990). Long-term exposure to high doses of antimony or antimonials has been shown to adversely affect longevity in animals (Schroeder et al., 1970). Limited data suggest that prenatal and postnatal exposure of rats to antimony interferes with vasomotor responses (Marmo et al., 1987; Rossi et al., 1987).

Acute inhalation exposure of humans may cause gastrointestinal disorders (probably due to ingestion of airborne antimony) (ATSDR, 1990). Long-term occupational exposure of humans has resulted in

electrocardiac disorders, respiratory disorders, and possibly increased mortality (Renes, 1953; Breiger et al., 1954). Antimony levels for these occupational exposure evaluations ranged from 2.2 to 11.98 mg Sb/m³. Based on limited data, occupational exposure of women to metallic antimony and several antimonials has reportedly caused alterations in the menstrual cycle and an increased incidence of spontaneous abortions (Belyaeva, 1967).

No data were available indicating that dermal exposure of humans to antimony or its compounds results in adverse effects. However dermal application of high doses of antimony oxide (1,584 mg Sb/kg) resulted in the death of rabbits within one day (IBTL, 1972). Eye irritation due to exposure to stibine gas and several antimony oxides has been reported for humans (Stevenson, 1965; Potkonjak and Pavlovich, 1983).

Arsenic: Arsenic is also known as gray arsenic or arsenic. Arsenic is a naturally-occurring metalloid element. Pure arsenic is not commonly found in the environment. It is usually found combined with one or more other elements, such as oxygen, chlorine, or sulphur. Arsenic combined with these elements is referred to as inorganic arsenic, while arsenic combined with carbon and hydrogen is referred to as organic arsenic. The organic arsenic forms are usually less toxic than the inorganic forms.

The results of human studies indicate that doses as low as 20 to 60 ug/kg/day may produce the characteristic signs of arsenic toxicity, including gastrointestinal irritation, anemia, neuropathy, skin lesions, vascular lesions, and lipidic or renal injury. There does not appear to be a strong trend toward cumulative toxicity because doses of about 50 ug/kg/day produce similar effects after both short and long-term exposure. In most cases of subchronic or chronic exposure, many or all of the signs of arsenic toxicity are detected together, indicating systemic end points are similar. Doses of about 10 ug/kg/day do not generally cause measurable signs of arsenic intoxication.

Many reports indicated that dermal exposure to inorganic arsenic compounds leads to dermatitis. However, none of these reports provides quantitative information on dose-duration relationships.

Studies have indicated that skin cancer prevalence is proportional to arsenic exposure level. Other studies show the same results, which increased frequency of skin cancer or internal cancer in individuals exposed to water containing 0.3 mg/l or more. Failure to detect significant increases at lower doses may be due to lack of statistical power in the studies, or it could suggest that arsenic-induced cancers have a threshold dose.

Many studies report above-average lung cancer rates in groups of people with above-average exposure to airborne arsenic. It has been concluded that arsenic is a more potent lung carcinogen than previously believed, with a dose-response relationship concave downward at exposure levels below 10,000 $\mu\text{g}/\text{m}^3/\text{year}$. The relationship between lung cancer and urinary arsenic levels was linear, suggesting that bioavailability and lung absorption of arsenic tend to be proportionately greater at low exposure levels than at high exposure levels.

Measures of memory disturbance and sleep disorders were found in exposed workers (IRIS, 2000). Exposed workers also reported more anger, fatigue, and confusion. Probably the most widely recognized form of hypersensitivity to mercury poisoning is the uncommon syndrome known as acrodynia (IRIS, 2000).

Barium: Barium is a silvery white metallic element which oxidizes very easily. It is one of the less expensive metals that have the distinctive properties of absorbing gases. It belongs to the alkaline earth group, resembling calcium chemically. The most important compounds are peroxide, chloride, sulfate, carbonate, nitrate, and chlorate. Traces of barium are very widely distributed.

Compounds of barium can be highly toxic. The fatal dose of BaCl_2 for man is reported to be between 0.8 and 0.9 g (0.55 to 0.6 g as Ba).

Soluble barium compounds are very toxic to humans after exposure by inhalation or ingestion. The greatest effect of barium poisoning is a strong, prolonged stimulant action on muscle. Effects on the hematopoietic system and cerebral cortex of humans have also been reported. Inhalation of barium sulfate dust, barium oxide dust, and barium carbonate gives rise to baritosis, a benign pneumoconiosis and occupational disease.

Baritosis was first described in Italy. Baritosis was later reported in the United States in barite miners by Pendergrass Leopold, in Germany, and in Czechoslovakia. Baritosis also occurred among workers handling lithopone. Baritosis causes no specific symptoms and no changes in pulmonary function.

Brenniman, et al., concluded that there was no statistically significant difference in blood pressure between humans ingesting drinking water containing barium at 7.3 mg/L compared with 0.1 mg/L. A concentration of 7.3 mg/L corresponds to a dose of 0.20 mg/kg/day (assuming that a 70-kg adult drinks 2 L/day).

Perry, et al., exposed weaning rats to barium at 1, 10, or 100 ppm in drinking water for up to 16 months (average daily barium doses of 0.051, 0.51, and 5.1 mg/kg, respectively). There were no signs of

toxicity at any barium dose level. Systolic blood pressure measurements revealed no increase in pressure in animals exposed to 1 ppm barium for 16 months, an increase of 4 mm Hg ($p < 0.01$) in animals exposed to 10 ppm barium for 16 months, and an increase of 16 mm HG ($p < 0.001$) in animals exposed to 100 ppm barium for 16 months. The animals in this study were maintained in a special contaminant-free environment and fed a diet designed to reduce exposure to trace metals. It is possible that the restricted intake of certain beneficial metals (e.g., calcium and potassium) may have predisposed the test animals to the hypertensive effects of barium.

No evidence of the carcinogenicity of barium could be located in the literature.

EPA has established an MCL of 2 mg/L for barium.

Cadmium. Cadmium is a silver-blue-white metal. Pure metallic cadmium is not common in the environment. It is most often encountered in combination with other elements such as oxygen, chlorine, and sulfur. Metallic cadmium has a low melting point for metal and is insoluble in water.

U.S. EPA conducted a toxicokinetic model to determine the highest level of exposure associated with a lack of proteinuria of the human renal cortex (i.e., the critical effect).

Human epidemiological studies of cadmium smelter workers supply limited evidence of human studies human lung carcinogenicity. The study by Thun et al. (1985) was reported by the U.S. EPA Carcinogen Assessment Group as not adequately accounting for the possibilities of confounding factors due to the presence of arsenic or to smoking. Other studies have linked cadmium with prostate cancer, and again lung cancer; however, these studies also did not take the presence of other carcinogens into effect.

Chromium: The ammonium and alkali metal salts of hexavalent chromium are generally water-soluble, but the alkaline metal salts (calcium, strontium) are sparingly soluble or insoluble in water. Hexavalent chromium rarely occurs in nature apart from man-made sources because it is readily reduced in the presence of oxidizable organic matter; however, hexavalent chromium compounds that occur most commonly in the form of chromate and dichromate are stable in many natural waters because of the low concentration of reducing matter. Except acetate and nitrate salts, the trivalent chromium compounds are generally insoluble in water. In most biological systems, chromium is present in the trivalent form. The physical or chemical forms and the mode by which chromium (III) compounds are incorporated into biological systems are poorly characterized.

Chromium (hexavalent) compounds can cause DNA and chromosome damage in animals and humans. Inhalation of hexavalent chromium salts cause inflammation and irritation of the nasal mucosa, and

ulceration and perforation of the nasal septum. Hexavalent chromium also produces kidney damage in humans and animals. Trivalent chromium, which is less toxic than hexavalent chromium, causes dermatitis in humans upon contact. Inhalation exposure has several key effects including respiratory tract effects, irritation of the nasal mucosa, transient decreases in lung function, and induction of cancer. Many cases of nasal mucosal ulceration and perforation have been reported in workers exposed to hexavalent chromium. Slight effect on lung function have also been observed in exposed workers.

The limited chronic oral studies of hexavalent chromium and trivalent chromium compounds have not resulted in significant tumor incidence. Case studies and epidemiological studies for the inhalation route of exposure indicate that occupational exposure to chromium compounds is associated with respiratory cancer. Although these studies do not clearly implicate specific compounds or the valence state of chromium involved, the results of animal testing implicate hexavalent chromium.

Copper: Copper is a reddish metal that occurs naturally in rock, soil, water, sediment, and air. Its average concentration in the earth's crust is about 50 parts per million. Copper has the ability to alloy with many metals, such as zinc, tin, and beryllium. Next to copper metal, copper sulfate is the most commercially important use of copper. Copper sulfate is also produced as a by-product of copper production by ore-leaching with sulfuric acid.

There are a number of human cases where they were exposed to levels of copper. For example, cases where the single dose was estimated to be between 0.1 mg/kg and 0.14 mg/kg, symptoms of diarrhea, vomiting, and nausea were common.

High levels of copper can be toxic to humans. Metallic copper dust exposure can cause illness similar to metal fume fever which includes chills, fever, aching muscles, dryness of mouth, and headache. Exposure to copper fumes produces respiratory tract irritation, nausea, metal fume fever, and discoloration of skin and nails. More serious systematic toxic effects include hemolysis, hepatic narcosis, gastrointestinal bleeding, hematuria, proteinuria, convulsions, and death.

Little information exists concerning subchronic toxicity of copper in the usual laboratory species. The one study in the literature that used rats noted an accumulation of copper in the liver and kidney but no accumulation was found in the cornea or brain. No criteria of toxicity was mentioned. Several studies on pigs revealed accelerated weight gain at dosed between 1.8 – 3.2 mg/kg/day. At 5.5 mg/kg/day, reduced growth and hemoglobin levels were noted, as well as increased liver copper concentrations.

Iron: Iron is a white, malleable, ductile metallic chemical element that can be readily magnetized, rusts rapidly in moist or salty air, and is vital to plant and animal life. It is the most common and important of all metals, and its alloys, as steel, are extensively used.

The human body contains only about 0.004 percent of iron, or 3 to 4 grams in an adult. About 70 percent of the iron is present in the hemoglobin, the pigment of the red blood cells. Most of the rest (about 30 percent) is present as a reserve stored in the liver, spleen, and bone marrow. Despite the very small amount in the body, iron is one of the most important elements in nutrition and of fundamental importance of life. It is a component of hemoglobin, myoglobin and cytochromes, catalase, and peroxidase. As part of these heme complexes and metalloenzymes, it serves important functions in oxygen transport and cellular respiration.

The greatest absorption of iron occurs in the upper part of the small intestine, in the duodenum and jejunum, although a small amount of absorption takes place from the stomach and throughout the whole intestine.

In order to provide for the retention of 1 mg per day in adult males and postmenopausal females, and assuming an average availability of 10 percent of the food iron, an allowance of 10 mg per day is recommended. Higher recommended allowances are made during the critical periods; in infancy, in childhood and adolescence, during the female reproductive period, pregnancy, and early lactation.

Free iron ions are very toxic. Therefore, the iron molecule (in food) is always transported in combination with protein; two atoms of ferric iron are bound to one molecule of beta globulin protein; called transferrin. When the level of iron ions exceeds the binding capacity of the transferrin, iron toxemia occurs. Normally, the amount of iron in plasma is sufficient to bind only 1/3 of the transferrin - the remaining 2/3 represents the unbound reserve.

Iron overload may occur as a result of metabolic defects, such as idiopathic hemochromatosis, an inherited disease, or from high intakes of iron. The clinical signs and symptoms of iron overload may include hyperpigmentation of the skin, cirrhosis of the liver, diabetes, and myocardial failure.

Approximately 2,000 cases of iron poisoning occur each year in the United States, mainly in young children who ingest the medicinal iron supplements of their parents. The lethal dose of ferrous sulfate for a 2 year old is about 3 grams; for an adult is between 200 and 250 mg/kg, depending upon body weight.

Lead: Lead occurs naturally as a sulfide in galena. It is a soft, bluish-white, silvery gray, malleable metal with a melting point of 327.5C. Elemental lead reacts with hot boiling acids and is attacked by pure water. The solubility of lead salts in water varies from insoluble to soluble depending on the type of salt (IARC, 1980; Goyer, 1988; Budavari et al., 1989).

Lead is a natural element that is persistent in water and soil. Most of the lead in environmental media is of anthropogenic sources. The mean concentration is 3.9 ug/L in surface water and 0.005 ug/L in sea water. Concentrations of lead in river sediments have been estimated at about 23 mg/kg, and lead in coastal sediments range from 1 mg/kg to 912 mg/kg with a mean value of 87 mg/kg (ATSDR, 1999). Soil content varies with the location, ranging up to 30 mg/kg in rural areas, 3000 mg/kg in urban areas, and 20,000 mg/kg near point sources. Human exposure occurs primarily through diet, air, drinking water, and ingestion of dirt and paint chips (EPA, 1989; ATSDR, 1999).

The efficiency of lead absorption depends on the route of exposure, age, and nutritional status. Adult humans absorb about 10-15 percent of ingested lead, whereas children may absorb up to 50 percent, depending on whether lead is in the diet, dirt, or paint chips. More than 90 percent of lead particles deposited in the respiratory tract are absorbed into systemic circulation. Inorganic lead is not efficiently absorbed through the skin; consequently, this route does not contribute considerably to the total body lead burden (EPA, 1986a).

Lead absorbed into the body is distributed to three major compartments: blood, soft tissue, and bone. The largest compartment is the bone, which contains about 95 percent of the total body lead burden in adults and about 73 percent in children. The half-life of bone lead is more than 20 years. The concentration of blood lead changes rapidly with exposure, and its half-life of only 25-28 days is considerably shorter than that of bone lead. Blood lead is in equilibrium with lead in bone and soft tissue. The soft tissues that take up lead are liver, kidneys, brain, and muscle. Lead is not metabolized in the body, but it may be conjugated with glutathione and excreted primarily in the urine (EPA, 1986a,c; ATSDR, 1993). Exposure to lead is evidenced by elevated blood lead levels.

The systemic toxic effects of lead in humans have been well-documented by the EPA (EPA, 1986a-e, 1989a, 1990) and ATSDR (1993), who extensively reviewed and evaluated data reported in the literature up to 1991. The evidence shows that lead is a multitargeted toxicant, causing effects in the gastrointestinal tract, hematopoietic system, cardiovascular system, central and peripheral nervous systems, kidneys, immune system, and reproductive system. Overt symptoms of subencephalopathic central nervous system (CNS) effects and peripheral nerve damage occur at blood lead levels of 40-60 ug/dL, and nonovert symptoms, such as peripheral nerve dysfunction, occur at levels of 30-50

ug/dL in adults; no clear threshold is evident. Cognitive and neuropsychological deficits are not usually the focus of studies in adults, but there is some evidence of neuropsychological impairment (Ehle and McKee, 1990) and cognitive deficits in lead workers with blood levels of 41-80 ug/dL (Stollery et al., 1993).

Although similar effects occur in adults and children, children are more sensitive to lead exposure than are adults. Irreversible brain damage occurs at blood lead levels greater than or equal to 100 ug/dL in adults and at 80-100 ug/dL in children; death can occur at the same blood levels in children. Children who survive these high levels of exposure suffer permanent severe mental retardation.

As discussed previously, neuropsychological impairment and cognitive (IQ) deficits are sensitive indicators of lead exposure; both neuropsychological impairment and IQ deficits have been the subject of cross-sectional and longitudinal studies in children. One of the early studies reported IQ score deficits of four points at blood lead levels of 30-50 ug/dL and one to two points at levels of 15-30 ug/dL among 75 black children of low socioeconomic status (Schroeder and Hawk, 1986).

Very detailed longitudinal studies have been conducted on children (starting at the time of birth) living in Port Pirie, Australia (Vimpani et al., 1985, 1989; McMichael et al., 1988; Wigg et al., 1988; Baghurst et al., 1992a,b), Cincinnati, Ohio (Dietrich et al., 1986, 1991, 1992, 1993), and Boston, Massachusetts (Bellinger et al., 1984, 1987, 1990, 1992; Stiles and Bellinger 1993). Various measures of cognitive performance have been assessed in these children. Studies of the Port Pirie children up to 7 years of age revealed IQ deficits in 2-year-old children of 1.6 points for each 10-ug/dL increase in blood lead, deficits of 7.2 points in 4-year-old children, and deficits of 4.4 to 5.3 points in 7-year-old children as blood lead increased from 10-30 ug/dL. No significant neurobehavioral deficits were noted for children, 5 years or younger, who lived in the Cincinnati, Ohio, area. In 6.5-year-old children, performance IQ was reduced by 7 points in children whose lifetime blood level exceeded 20 ug/dL.

Children living in the Boston, Massachusetts, area have been studied up to the age of 10 years. Cognitive performance scores were negatively correlated with blood lead in the younger children in the high lead group (greater than or equal to 10 ug/dL), and improvements were noted in some children at 57 months as their blood lead levels became lower. However, measures of IQ and academic performance in 10-year-old children showed a 5.8-point deficit in IQ and an 8.9-point deficit in academic performance as blood lead increased by 10 ug/dL within the range of 1-25 ug/dL. Because of the large database on subclinical neurotoxic effects of lead in children, only a few of the

studies have been included. However, EPA (EPA, 1986a, 1990) concluded that there is no clear threshold for neurotoxic effects of lead in children.

In adults, the cardiovascular system is a very sensitive target for lead. Hypertension (elevated blood pressure) is linked to lead exposure in occupationally exposed subjects and in the general population. Three large population-based studies have been conducted to study the relationship between blood lead levels and high blood pressure. The British Regional Heart Study (BRHS) (Popcock et al., 1984), the NHANES II study (Harlan et al., 1985; Pirkle et al., 1985; Landis and Flegal, 1988; Schwartz, 1990; EPA, 1990), and Welsh Heart Programme (Ellwood et al., 1988a,b) comprise the major studies for the general population. The BRHS study showed that systolic pressure greater than 160 mm Hg and diastolic pressure greater than 100 mm Hg were associated with blood lead levels greater than 37 ug/dL (Popcock et al., 1984). An analysis of 9933 subjects in the NHANES study showed positive correlations between blood pressure and blood lead among 12-74-year-old males but not females (Harlan et al., 1985; Landis and Flegal et al., 1988), 40-59-year-old white males with blood levels ranging from 7-34 ug/dL (Pirkle et al., 1985), and males and females greater than 20 years old (Schwartz, 1991). In addition, left ventricular hypertrophy was also positively associated with blood lead (Schwartz, 1991). The Welsh study did not show an association among men and women with blood lead of 12.4 and 9.6 ug/dL, respectively (Ellwood et al., 1988a,b). Other smaller studies showed both positive and negative results. The EPA (EPA, 1990) concluded that increased blood pressure is positively correlated with blood lead levels in middle-aged men, possibly at concentrations as low as 7 ug/dL. In addition, the EPA estimated that systolic pressure is increased by 1.5-3.0 mm Hg in males and 1.0-2.0 mm Hg in females for every doubling of blood lead concentration.

The hematopoietic system is a target for lead as evidenced by frank anemia occurring at blood lead levels of 80 ug/dL in adults and 70 ug/dL in children. The anemia is due primarily to reduced heme synthesis, which is observed in adults having blood levels of 50 ug/dL and in children having blood levels of 40 ug/dL. Reduced heme synthesis is caused by inhibition of key enzymes involved in the synthesis of heme. Inhibition of erythrocyte -aminolevulinic acid dehydrase (ALAD) activity (catalyzes formation of porphobilinogen from -aminolevulinic acid) has been detected in adults and children having blood levels of less than 10 ug/dL. ALAD activity is the most sensitive measure of lead exposure, but erythrocyte zinc protoporphyrin is the most reliable indicator of lead exposure because it is a measure of the toxicologically active fraction of bone lead. The activity of another erythrocyte enzyme, pyrimidine-5-nucleotidase, is also inhibited by lead exposure. Inhibition has been observed at levels below 5 ug/dL; no clear threshold is evident.

Other organs or systems affected by exposure to lead are the kidneys, immune system, reproductive system, gastrointestinal tract, and liver. These effects usually occur at high blood levels, or the blood levels at which they occur have not been sufficiently documented.

The EPA has not developed an RfD for lead because it appears that lead is a nonthreshold toxicant, and it is not appropriate to develop RfDs for these types of toxicants. Instead the EPA has developed the Integrated Exposure Uptake Biokinetic Model to estimate the percentage of the population of children up to 6 years of age with blood lead levels above a critical value, 10 ug/dL. The model determines the contribution of lead intake from multimedia sources (diet, soil and dirt, air, and drinking water) on the concentration of lead in the blood. Site-specific concentrations of lead in various media are used when available; otherwise default values are assumed. The EPA has established a screening level of 400 ppm (ug/g) for lead in soil (EPA, 1994a).

Inorganic lead and lead compounds have been evaluated for carcinogenicity by the EPA (EPA, 1989, 1993). The data from human studies are inadequate for evaluating the potential carcinogenicity of lead. Data from animal studies, however, are sufficient based on numerous studies showing that lead induces renal tumors in experimental animals. A few studies have shown evidence for induction of tumors at other sites (cerebral gliomas; testicular, adrenal, prostate, pituitary, and thyroid tumors). A slope factor was not derived for inorganic lead or lead compounds.

Manganese: Manganese is a steel gray, lustrous, hard, brittle metal. Manganese is a ubiquitous element that is essential for normal functioning in all animal species. There are many reports of toxicity to humans exposed to manganese by inhalation; much less is known, however, about oral intakes resulting in toxicity (IRIS, 1998). It is important to emphasize that individual requirements for, as well as, reactions to, manganese may be highly variable. The Food and Nutrition Board of the National Research Council determined an "estimated safe and adequate daily dietary intake" of manganese to be 2-5 mg/day for adults.

Many constituents of a vegetarian diet (i.e., phytates, fiber) have been found to inhibit manganese absorption, presumably by forming insoluble complexes in the gut. In addition, dietary levels of calcium or phosphorus have been reported to decrease manganese absorption. Individuals who are deficient in iron demonstrate an increase in manganese absorption.

While manganese is clearly an essential element, it has also been demonstrated to be the causative agent in a syndrome of neurologic psychiatric disorders that has been described in manganese miners. Toxicologic responses in humans consuming large amounts of manganese dissolved in drinking water

resulted in lethargy, increased tonus, tremor, and mental disturbances. The most severe symptoms were in elderly people, while children appeared to be unaffected.

Although conclusive evidence is lacking, some investigators have linked increased intakes of manganese with violent behavior. The authors of the studies suggest that a "a combination of co-factors, such as the abuse of alcohol or other chemical substances as psychosocial factors, acting in concert with mild manganese toxicity promote violent behavior."

Zinc: Zinc is used primarily in galvanized metals and metal alloys, but zinc compounds also have wide commercial applications as chemical intermediates, catalysts, pigments, vulcanization activators and accelerators in the rubber industry, UV stabilizers, and supplements in animal feeds and fertilizers. They are also used in rayon manufacture, smoke bombs, soldering fluxes, mordants for printing and dyeing, wood preservatives, mildew inhibitors, deodorants, antiseptics, and astringent (Lloyd, 1984; ATSDR, 1989). In addition, zinc phosphide is used as a rodenticide.

Zinc is an essential element with recommended daily allowances ranging from 5 mg for infants to 15 mg for adult males (NRC, 1989).

Gastrointestinal absorption of zinc is variable (20-80 percent) and depends on the chemical compound as well as on zinc levels in the body and dietary concentrations of other nutrients (U.S. EPA, 1984). In individuals with normal zinc levels in the body, gastrointestinal absorption is 20-30 percent (ATSDR, 1989). Information on pulmonary absorption is limited and complicated by the potential for gastrointestinal absorption due to mucociliary clearance from the respiratory tract and subsequent swallowing. Zinc is present in all tissues with the highest concentrations in the prostate, kidney, liver, heart, and pancreas. Zinc is a vital component of many metalloenzymes such as carbonic anhydrase, which regulates CO_2 exchange (Stokinger, 1981). Homeostatic mechanisms involving metallothionein in the mucosal cells of the gastrointestinal tract regulate zinc absorption and excretion (ATSDR, 1989).

In humans, acutely toxic oral doses of zinc cause nausea, vomiting, diarrhea, and abdominal cramps and in some cases gastric bleeding (Elinder, 1986; Moore, 1978; ATSDR, 1989). Ingestion of zinc chloride can cause burning in the mouth and throat, vomiting, pharyngitis, esophagitis, hypocalcemia, and elevated amylase activity indicative of pancreatitis (Chobanian, 1981). Zinc phosphide, which releases phosphine gas under acidic conditions in the stomach, can cause vomiting, anorexia, abdominal pain, lethargy, hypotension, cardiac arrhythmias, circulatory collapse, pulmonary edema, seizures, renal damage, leukopenia, and coma and death in days to weeks (Mack, 1989). The estimated fatal dose is 40 mg/kg. Animals dosed orally with zinc compounds develop pancreatitis, gastrointestinal and hepatic lesions, and diffuse nephrosis.

Gastrointestinal upset has also been reported in individuals taking daily dietary zinc supplements for up to 6 weeks (Samman and Roberts, 1987). There is also limited evidence that the human immune system may be impaired by subchronic exposures (Chandra, 1984). In animals, gastrointestinal and hepatic lesions, (Allen et al., 1983; Brink et al., 1959); pancreatic lesions (Maita et al., 1981; Drinker et al., 1927a); anemia (ATSDR, 1989; Fox and Jacobs, 1986; Maita et al., 1981); and diffuse nephrosis (Maita et al., 1981; Allen et al., 1983) have been observed following subchronic oral exposures.

Chronic oral exposures to zinc have resulted in hypochromic microcytic anemia associated with hypoceruloplasminemia, hypocupremia, and neutropenia in some individuals (Prasad et al., 1978; Porter et al., 1977). Anemia and pancreatitis were the major adverse effects observed in chronic animal studies (Aughey et al., 1977; Drinker et al., 1927a; Walters and Roe, 1965; Sutton and Nelson, 1937). Teratogenic effects have not been seen in animals exposed to zinc; however, high oral doses can affect reproduction and fetal growth (Ketcheson et al., 1969; Schlicker and Cox 1967, 1968; Sutton and Nelson, 1937).

Under occupational exposure conditions, inhalation of zinc compound (mainly zinc oxide fumes) can result in a condition identified as "metal fume fever", which is characterized by nasal passage irritation, cough, rales, headache, altered taste, fever, weakness, hyperpnea, sweating, pains in the legs and chest, leukocytosis, reduced lunch volume, and decreased diffusing capacity of carbon monoxide (ATSDR, 1989; Bertholf, 1988). Inhalation of zinc chloride can result in nose and throat irritation, dyspnea, cough, chest pain, headache, fever, nausea and vomiting, and respiratory disorders such as pneumonitis and pulmonary fibrosis (ITTII, 1988; ATSDR, 1989; Nemery, 1990). Pulmonary inflammation and changes in lung function have also been observed in inhalation studies on animals (Amur et al., 1982; Lam et al., 1985; Drinker and Drinker, 1928).

Although "metal fume fever" occurs in occupationally exposed workers, it is primarily an acute and reversible effect that is unlikely to occur under chronic exposure conditions when zinc air concentrations are less than $8\text{-}12\text{ mg/m}^3$ (ATSDR, 1989). Gastrointestinal distress, as well as enzyme changes indicative of liver dysfunction, have also been reported in workers occupationally exposed to zinc (NRC, 1979; Stokinger, 1981; U.S. EPA, 1991a; Guja, 1973; Badaway et al., 1987a); however, it is unclear as to what extent these effects might have been caused by pulmonary clearance, and subsequent gastrointestinal absorption. Consequently, there are no clearly defined toxic effects that can be identified as resulting specifically from pulmonary absorption following chronic low level inhalation exposures. Animal data for chronic inhalation exposures are not available.

No case studies or epidemiologic evidence has been presented to suggest that zinc is carcinogenic in humans by the oral or inhalation route (U.S. EPA, 1991a). In animal studies, zinc sulfate in drinking

water or zinc oleate in the diet of mice for a period one year did not result in a statistically significant increase in hepatomas, malignant lymphomas, or lung adenomas (Walters and Roe, 1965); however, in a 3-year, 5-generation study on tumor-resistant and tumor-susceptible strains of mice, exposure to zinc in drinking water resulted in increased frequencies of tumors from the F_0 to the F_4 generation in the tumor-resistant strain (from 0.8 to 25.7 percent vs. 0.0004 percent in the controls), and higher tumor frequencies in two tumor-susceptible strains (43.4 percent and 32.4 percent vs. 15 percent in the controls) (Halme, 1961).

Zinc is placed in weight-of-evidence Group D, not classifiable as to human carcinogenicity due to inadequate evidence in humans and animals (U.S. EPA, 1991a).

Organics

Aldrin: Aldrin is an organochlorine insecticide also known as HHDN, Octalene, and Aldrec. Pure aldrin is a colorless crystalline solid and a 95 percent mixture is tan to dark brown. 27 micrograms of Aldrin will dissolve in one liter of water, making it very insoluble (ATSDR 1988).

The health effects as related to the noncarcinogenic effects of aldrin are demonstrated by Fitzhugh, et al., (1964). Rats were fed aldrin at levels of 0 to 150 ppm for two years. Liver lesions characteristic of chlorinated insecticide poisoning were observed at dose levels of 0.5 ppm and greater. A statistically significant increase in liver-to-body weight ratio was observed at all dose levels (IRIS 1987).

Regarding the carcinogenic effects of aldrin, human carcinogenicity data are inadequate for evidence of aldrin being a human carcinogen. Animal studies, however, are sufficient to classify aldrin as a probable human carcinogen or group B2.

Orally administered aldrin produced significant increases in tumor responses in three different strains of mice in both males and females. Tumor induction has been observed for structurally related chemicals, including dieldrin, a metabolite.

Benzo[a]pyrene: Benzo[a]pyrene is a polycyclic aromatic hydrocarbon (PAH) that can be derived from coal tar. Benzo[a]pyrene occurs ubiquitously in products of incomplete combustion of fossil fuels and has been identified in ambient air, surface water, drinking water, waste water, and char-broiled foods (IARC, 1983). Benzo[a]pyrene is primarily released to the air and removed from the atmosphere by photochemical oxidation and dry deposition to land or water. Biodegradation is the most important transformation process in soil or sediment (ATSDR, 1990).

Benzo[a]pyrene is readily absorbed following inhalation, oral, and dermal routes of administration (ATSDR, 1990). Following inhalation exposure, benzo[a]pyrene is rapidly distributed to several tissues in rats (Sun et al., 1982; Weyand and Bevan, 1986). The metabolism of benzo[a]pyrene is complex and includes the formation of a proposed ultimate carcinogen, benzo[a]pyrene 7,8 diol-9, 10-epoxide (IARC, 1983). The major route of excretion is hepatobiliary followed by elimination in the feces (EPA, 1991).

No data are available on the system (non-carcinogenic) effects of benzo[a]pyrene in humans. In mice genetic differences appear to influence the toxicity of benzo[a]pyrene. Subchronic dietary administration of 120 mg/kg benzo[a]pyrene for up to 180 days resulted in decreased survival due to hematopoietic effects (bone marrow depression) in a "nonresponsive" strain of mice (i.e., a strain whose cytochrome P-450 mediated enzyme activity is not induced as consequence of PAH exposure). No adverse effects were noted in "responsive" mice (i.e., a strain capable of inducing increased cytochrome P-450 mediated enzyme activity as a consequence of PAH exposure) (Robinson et al., 1975). Immunosuppression has been reported in mice administered daily intraperitoneal injections of 40 or 160 mg/kg of benzo[a]pyrene for 2 weeks, with more pronounced effects apparent in "nonresponsive" mice (Blanton et al., 1986; White et al., 1985). In utero exposure to benzo[a]pyrene has produced developmental/reproductive effects in mice. Dietary administration of doses as low as 10 mg/kg during gestation caused reduced fertility and reproductive capacity in offspring (Mackenzie and Angevine, 1981), and treatment by gavage with 120 mg/kg/day during gestation caused stillbirths, resorptions, and malformations (Legraverend et al., 1984). Similar effects have been reported in intraperitoneal injection studies (ATSDR, 1990). Neither a reference dose (RfD) nor a reference concentration (RfC) has been derived for benzo[a]pyrene.

Numerous epidemiologic studies have shown a clear association between exposure to various mixtures of PAHs containing benzo[a]pyrene (e.g., coke oven emissions, roofing tar emissions, and cigarette smoke) and increased risk of lung cancer and other tumors. However, each of the mixtures also contained other potentially carcinogenic PAHs; therefore, it is not possible to evaluate the contribution of benzo[a]pyrene to the carcinogenicity of these mixtures (IARC, 1983; EPA, 1991). An extensive data base is available for the carcinogenicity of benzo[a]pyrene in experimental animals. Dietary administration of benzo[a]pyrene has produced papillomas and carcinomas of the forestomach in mice (Neal and Rigdon, 1967), and treatment by gavage has produced mammary tumors in rats (McCormick et al., 1981) and pulmonary adenomas in mice (Wattenberg and Leong, 1970). Exposure by inhalation and intratracheal instillation has resulted in benign and malignant tumors of the respiratory and upper digestive tracts of hamsters (Ketkar et al., 1978; Thyssen et al., 1981). Numerous topical application studies have shown that benzo[a]pyrene induces skin tumors in several species, although mice appear to be the most sensitive species. Benzo[a]pyrene is a complete carcinogen and also an

indicator of skin tumors (IARC, 1973; EPA, 1991). Benzo[a]pyrene has also been reported to induce tumors in animals when administered by other routes, such as intravenous, intraperitoneal, subcutaneous, intrapulmonary, and transplacental.

Dieldrin: Dieldrin is not known to occur naturally. It has been used extensively in the past as an insecticide for corn and for termite control; however, it is no longer registered for general use. Dieldrin is extremely persistent, but it is known to slowly photo rearrange to photo dieldrin.

Two studies of workers exposed to aldrin and dieldrin reported no increased incidence of cancer. Both studies were limited in their ability to detect an excess of cancer deaths. Van Raalte (1977) observed two workers exposed 4-19 years and followed from 15-20 years. Exposure was not quantified, and workers were also exposed to other organochlorine pesticides. The number of workers studied was small, the mean age cohort (47.7 years) was young, the number of expected deaths was not calculated, and the duration of exposure and latency was relatively short.

In a retrospective mortality study, Ditraglia et al. (1981) reported no statistically significant excess deaths from cancer among 1155 organochlorine pesticide manufacturing workers. Workers were employed for 6 months or more and followed 13 years or more. Workers with no exposure were included in the cohort. Vital status was not known for 112 or 10 percent of the workers, and these were workers were assumed to be alive. Therefore, additional deaths may have occurred but were not observed. Exposure was not quantified and workers were also exposed to other chemicals and pesticides. Increased incidences of deaths from cancer were seen at several specific sites: esophagus, rectum, liver, and lymphatic and hematopoietic system, but these site-specific incidences were not statistically significantly increased.

In several studies conducted by Walker et al. (1972) dieldrin has been shown to be carcinogenic in various strains of mice of both sexes. At different dose levels the effects range from benign liver tumors, to hepatocarcinomas with transplantation confirmation, to pulmonary metastasises.

Heptachlor: Heptachlor, a cyclodiene insecticide, was extensively used until the 1970s for the control of a variety of insects. During those years, people could be exposed to Heptachlor, usually as its oxidation product heptachlor epoxide, by way of food or in the air, after treatment of a house for termites. At the present time, its only permitted commercial use in the United States is fire ant control in power transformers. Heptachlor is converted to heptachlor epoxide and other degradation products in the environment. The epoxide degrades more slowly and, as a result, is more persistent than heptachlor.

Heptachlor is absorbed from the gastrointestinal tract, lungs, and skin. It is distributed to various tissues, with highest levels occurring in adipose tissue. Transplacental transfer to the fetus has been reported (EPA 1986). Metabolism produces primarily heptachlor epoxide, which is more toxic than its parent compound. Heptachlor and its metabolites are eliminated primarily via feces (Tashiro and Matsumara 1978).

The primary adverse health effects associated with heptachlor are central nervous system and liver effects. For humans, acute oral exposure has resulted in abnormal behavior, hyperirritability, tremors, and convulsions (Leber and Benya 1994). Various central nervous system effects such as hyperexcitability, incoordination, tremors, muscle spasms, and seizures have also been reported in animals following acute and subchronic oral exposure (Akay and Alp 1981, Buck et al. 1959, EPA 1985). Oral LD₅₀ values for rabbits, rats, sheep, and calves are 2000, 90 to 160, 50, and 20 mg/kg, respectively (IARC 1979, Leber and Benya 1994). Although hepatic effects have not been reported in humans, chronic dietary exposure of rodents to 10 ppm heptachlor or to 10 ppm of a 25:75 mixture of heptachlor/heptachlor epoxide for 18 months has produced increased liver weights, liver lesions, and decreased body weight gains (Velsicol Chemical Corporation 1955, IRDC 1973).

Other effects reported in humans include blood dyscrasias as a result of exposure to heptachlor during home termite treatment (Epstein and Ozonoff 1987) and increased mortality from cerebrovascular disease in workers manufacturing pesticides. However, cardiovascular effects were not seen in a cohort of pesticide applicators with potentially high exposures to heptachlor (Wang and MacMahon 1979a,b).

An oral reference dose (RfD) of 5E-4 mg/kg/day for subchronic (EPA 1995a) and chronic exposure (EPA 1995a) to heptachlor was calculated based on a no-observed-adverse-effect level (NOAEL) of 0.15 mg/kg/day and a lowest-observed-adverse-effect level (LOAEL) of 0.25 mg/kg/day from a 2-year dietary study with rats (Velsicol Chemical Corporation 1955). Increased relative liver weight was identified as the critical effect. And inhalation reference concentration (RfC) for heptachlor has not been derived. Existing epidemiological studies on heptachlor are inadequate to establish a clear assessment of heptachlor exposure and human risk of developing cancer.

Heptachlor Epoxide: Heptachlor epoxide, an oxidation product of the cyclodiene insecticide heptachlor, is not produced commercially in the United States and is not known to occur naturally (ATSDR 1993, IARC 1979). However, heptachlor was extensively used until the 1970s for the control of a variety of insects. During those years, people could be exposed to heptachlor epoxide by way of food or in the air, after treatment of a house for termites. In the environment, heptachlor is converted to the epoxide, a chemical that degrades more slowly and, as a result, is more persistent than heptachlor.

In the body, heptachlor epoxide is formed by epoxidation of heptachlor. It is distributed to various tissues, with highest levels occurring in adipose tissues, where it may persist for prolonged periods. Heptachlor epoxide has been found in human fat, milk, and also in blood and fat of stillborn infants, indicating transplacental transfer to the fetus (IARC 1979, EPA 1986).

No studies were available regarding the toxic effects in humans after exposure to heptachlor epoxide. In laboratory animals, the liver and central nervous system are the primary target organs for heptachlor epoxide toxicity. Acute oral LD₅₀s for rats, mice, and rabbits range from 39 to 144 mg/kg (ATSDR 1993), indicating moderate acute oral toxicity. Hypoactivity, ruffled fur, and increased mortality occurred in mice given a single oral dose of 30 mg/kg of a 25:75 heptachlor:heptachlor epoxide mixture (Arnold et al. 1977), and muscle spasms in the head and neck region and convulsive seizures were observed in young calves fed 2.5 mg/kg/day of a heptachlor epoxide preparation for 3 days (Buck et al. 1959). Increased liver weights and hepatocytomegaly were reported in male and female CD-1 mice fed a diet containing 1 to 10 ppm of a 25:75 heptachlor:heptachlor epoxide mixture for 18 months (IRDC 1973). Increased liver weights were also seen in dogs administered diets containing 0.5 to 7.5 ppm heptachlor epoxide for 60 weeks (Dow Chemical Company 1958).

An oral reference dose (RfD) of 1.3E-5 mg/kg/day for subchronic (EPA 1995a) and chronic exposure (EPA 1995b) to heptachlor epoxide was calculated based on a lowest-observed-effect level (LOAEL) of 0.0125 mg/kg/day from a 60-week dietary study with dogs (Dow Chemical Company 1958). Increased relative liver weight was identified at the critical effect. An inhalation reference concentration (RfC) for heptachlor epoxide has not been derived. No epidemiological studies or case reports addressing the carcinogenicity of heptachlor epoxide in humans were available.

2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD): Dioxins is a generic name used to describe a family of compounds known as chlorinated dibenzo-p-dioxins. There are a total of 75 chemical congeners in the dioxin family. A dioxin molecule can have as few as one or as many as eight chlorine atoms attached to the dioxin molecule at any of the eight locations. The number of chlorine atoms and their position on the molecule determines the physical and chemical properties and the toxicity. The most notable, most studied, and most toxic chemical in this family is 2,3,7,8-tetrachlorodibenzo-p-dioxin, or 2,3,7,8-TCDD.

TCDD was first discovered as a by-product of chlorinated phenols in the 1950s. Studies with laboratory animals have shown TCDD to be extremely toxic and most potent carcinogen ever tested under laboratory conditions for some species of animals. However, the effects in humans exposed to TCDD have been more difficult to pin down. Because of this, animal studies have been used as the basis of most risk assessments for dioxins.

Guinea pigs have been shown to be highly susceptible to the lethal effects of 2,3,7,8-TCDD. The hamster is 3000 to 6000 times less sensitive. The signs of toxicity also vary considerably from species to species. Most animals exhibit a wasting-type syndrome characterized by progressive and profound loss in body weight. The mechanism of the wasting syndrome is not well understood, but some studies indicated that it may be related to an effect of TCDD on the thyroid gland. The liver was one of the target organs of TCDD-induced toxicity in several species. Reported effects included increased activities in liver enzymes indicative of pathological changes, changes to the liver weight, and necrosis. Although chloracne is a characteristic effect of human exposed to dioxins, it is not that typical in animals. However, hair loss, thickening of the skin, and development of acne-like lesions were reported in some studies. The most severe systemic effects were found in monkeys.

Studies in animals suggest that the immune system may be the earliest and most sensitive target of toxic effects caused by dioxins exposure. Organ changes include thymic and lymph node atrophy, and/or degenerative changes in bone marrow of treated animals. In addition, functional alterations in the immune response affecting both humoral and cell-mediated immunity were reported in numerous studies. Reproductive studies demonstrate that oral exposure to TCDD causes pre and/or postimplantation losses of fertilized eggs in rodents. Exposure of monkeys to TCDD during pregnancy caused spontaneous abortions of the fetuses. It has been proposed that dioxins block the estrous cycle by antagonizing the estrogen-induced uterine response to the egg. Other plausible mechanisms for adverse reproductive effects include effects on growth factor pathways.

Early human health studies in the 1970s and 1980s had many shortcomings, such as the small size of the group studied, coexposure to other chemicals, inadequate follow-up time, and inability to document TCDD exposure. A well known health effect observed in human populations exposed to relatively large amounts of TCDD is chloracne. Chloracne is a severe skin disease characterized by follicular hyperkeratosis (comedones) occurring with or without cysts and pustules. Chloracne has been reported in some workers involved in the production of 2,4,5-trichlorophenol and/or subsequent products. A recent study on the health status of Vietnam veterans did not find any signs of liver disease, but did report increased levels of triglycerides and cholesterol in the blood (a second report does not support these increases). In addition, an increase in body fat, diabetes, and blood pressure were also noted. Inhalation experiments have not been conducted to test the toxicity of 2,3,7,8-TCDD.

Background levels of TCDD and TCDD equivalents in breast milk are around 3 ppt and 39 ppt (lipid basis), respectively. In general, infants who are breast fed are exposed to higher levels of dioxins on a body weight basis than adults. Average daily uptake of breast-fed infants is 20 pg/kg body wt/day for TCDD and 180 pg/kg body wt/day for TCDD equivalents.

Polychlorinated Biphenyls (PCBs): This is a general assessment of PCBs, which include a wide variety of substances. Chemical-specific information is contained within individual listings. PCBs are classified B2, probable human carcinogens. A 1996 study found liver tumors in female rats exposed to Aroclors 1260, 1254, 1242, and 1016, and in male rats exposed to Aroclor 1260. These mixtures contain overlapping groups of congeners that, together, span the range of congeners most often found in environmental mixtures. Earlier studies found high, significantly significant incidences of liver tumors in rats ingesting Aroclor 1260 or Clophen A 60. Mechanistic studies are beginning to identify several congeners that have dioxin-like activity and may promote tumors by different modes of action. PCBs are absorbed through ingestion, inhalation, and dermal exposure, after which they are transported similarly through the circulation. This provides a reasonable basis for expecting similar internal effects from different routes of environmental exposure. Information on relative absorption rates suggests that differences in toxicity across exposure routes is small. The human studies are being updated; currently available evidence is inadequate, but suggestive (IRIS, 2000).

3 8 0259

APPENDIX E

Central Tendency Evaluation from Residential Areas

TABLE E.4.1.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil/Subsurface Soil
Exposure Point: Exposure Unit 1; Exposure Unit 2
Receptor Population: Resident
Receptor Age: Child

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/Reference | CT Value | CT Rationale/Reference | Intake Equation/Model Name |
|----------------|----------------|-----------------------------------|--------------------|----------------------------------|-------------------------|----------------------------------|------------------------|---|
| Ingestion | CS | Chemical Concentration in Soil | mg/kg | See Table 3 | See Table 3 | See Table 3 | See Table 3 | Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF1 \times 1/BW \times 1/AT$ |
| | IR-S | Ingestion Rate of Soil | mg/kg | 200 | EPA, 1991 | 100 | EPA, 1997a | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 350 | EPA, 1991 | |
| | ED | Exposure Duration | years | 6 | EPA, 1991 | 2 | EPA, 1993 | |
| | CF1 | Conversion Factor 1 | kg/mg | 10 ⁻⁶ | - | 10 ⁻⁶ | - | |
| | BW | Body Weight | kg | 15 | EPA, 1991 | 15 | EPA, 1991 | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | 25,550 | EPA, 1989 | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,190 | EPA, 1989 | 730 | EPA, 1989 | |
| Dermal | CS | Chemical Concentration in Soil | mg/kg | See Table 3 | See Table 3 | See Table 3 | See Table 3 | CDI (mg/kg-day) = $CS \times SA \times CF1 \times ABS \times AF \times EF \times ED \times 1/BW \times 1/AT$ |
| | SA | Skin Surface Area | cm ² | 4,000 | EPA, 1997a (1) | 3,900 | EPA, 1997a (1) | |
| | CF1 | Conversion Factor 1 | kg/mg | 10 ⁻⁶ | - | 10 ⁻⁶ | - | |
| | AF | Soil - to - Skin Adherence Factor | mg/cm ² | 1.0 | EPA, 1996a | 0.6 | EPA, 1996a | |
| | ABS | Absorption Factor | - | 0.1% Inorganics 1.0% Organics | EPA, 1996a | 0.1% Inorganics 1.0% Organics | EPA, 1996a | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 350 | EPA, 1991 | |
| | ED | Exposure Duration | years | 6 | EPA, 1991 | 2 | EPA, 1993 | |
| | BW | Body Weight | kg | 15 | EPA, 1991 | 15 | EPA, 1991 | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | 25,550 | EPA, 1989 | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,190 | EPA, 1989 | 730 | EPA, 1989 | |

(1) Professional Judgment

Sources:

EPA, 1997a: Exposure Factors Handbook

EPA, 1991: Standard Default Exposure Factors

EPA, 1989: RAGS Part A

EPA 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

TABLE E.4.2.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil/Subsurface Soil
Exposure Point: Exposure Unit 1; Exposure Unit 2
Receptor Population: Resident
Receptor Age: Adult

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/Reference | CT Value | CT Rationale/Reference | Intake Equation/Model Name |
|----------------|----------------|-----------------------------------|--------------------|----------------------------------|-------------------------|----------------------------------|------------------------|---|
| Ingestion | CS | Chemical Concentration in Soil | mg/kg | See Table 3 | See Table 3 | See Table 3 | See Table 3 | Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF1 \times 1/BW \times 1/AT$ |
| | IR-S | Ingestion Rate of Soil | mg/kg | 100 | EPA, 1991 | 50 | EPA, 1997a | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 350 | EPA, 1991 | |
| | ED | Exposure Duration | years | 24 | EPA, 1991 | 7 | EPA, 1993 | |
| | CF1 | Conversion Factor 1 | kg/mg | 10-6 | — | 10-6 | — | |
| | BW | Body Weight | kg | 59 | — | 59 | — | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | 25,550 | EPA, 1989 | |
| | AT-N | Averaging Time (Non-Cancer) | days | — | — | 2,555 | EPA, 1989 | |
| Dermal | CS | Chemical Concentration in Soil | mg/kg | See Table 3 | See Table 3 | See Table 3 | See Table 3 | CDI (mg/kg-day) = $CS \times SA \times CF1 \times ABS \times AF \times EF \times ED \times 1/BW \times 1/AT$ |
| | SA | Skin Surface Area | cm ² | 5,000 | EPA, 1997a (1) | 5,000 | EPA, 1997a (1) | |
| | CF1 | Conversion Factor 1 | kg/mg | 10-6 | — | 10-6 | — | |
| | AF | Soil - to - Skin Adherence Factor | mg/cm ² | 1.0 | EPA, 1996a | 0.8 | EPA, 1996a | |
| | ABS | Absorption Factor | — | 0.1% Inorganics 1.0% Organics | EPA, 1996a | 0.1% Inorganics 1.0% Organics | EPA, 1996a | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 350 | EPA, 1991 | |
| | ED | Exposure Duration | years | 24 | EPA, 1991 | 7 | EPA, 1993 | |
| | BW | Body Weight | kg | 59 | (2) | 59 | (2) | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | 25,550 | EPA, 1989 | |
| | AT-N | Averaging Time (Non-Cancer) | days | — | — | 2,555 | EPA, 1989 | |
| | | | | | | | | |

(1) Professional Judgment

(2) Based on site-specific information and a letter, dated October 11, 2000, from Glenn Adams, US EPA Region 4, to David A. Ludder, Legal Environmental Assistance Foundation.

Sources:

EPA, 1997a: Exposure Factors Handbook

EPA, 1991: Standard Default Exposure Factors

EPA, 1989: RAGS Part A

EPA 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

380261

TABLE E.4.3.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
BROWN'S DUMP SITE

Scenario Timeframe: Future
Medium: Water
Exposure Medium: Groundwater
Exposure Point: Tap
Receptor Population: Resident
Receptor Age: Child

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|----------------|----------------|---------------------------------------|-----------|-------------|--------------------------|-------------|-------------------------|---|
| Ingestion | CW | Chemical Concentration in Groundwater | mg/L | See Table 3 | See Table 3 | See Table 3 | See Table 3 | Chronic Daily Intake (CDI) (mg/kg-day) = CW x IR x EF x ED x 1/BW x 1/AT |
| | IR-W | Ingestion Rate of Water | L/day | 1 | EPA, 1997a | 0.5 | (1) | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 234 | EPA, 1993 | |
| | ED | Exposure Duration | years | 6 | EPA, 1991 | 2 | EPA, 1993 | |
| | BW | Body Weight | kg | 15 | EPA, 1991 | 15 | EPA, 1991 | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | 25,550 | EPA, 1989 | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,190 | EPA, 1989 | 730 | EPA, 1989 | |

Sources:

EPA 1997a: Exposure Factors Handbook

EPA 1991: Standard Default Exposure Factors

EPA, 1989: RAGS Part A

EPA, 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

TABLE E.4.4.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
BROWN'S DUMP SITE

Scenario Timeframe: Future
Medium: Water
Exposure Medium: Groundwater
Exposure Point: Tap
Receptor Population: Resident
Receptor Age: Adult

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|----------------|----------------|---------------------------------------|-----------|-------------|--------------------------|-------------|-------------------------|---|
| Ingestion | CW | Chemical Concentration in Groundwater | mg/L | See Table 3 | See Table 3 | See Table 3 | See Table 3 | Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF1 \times 1/BW \times 1/AT$ |
| | IR-W | Ingestion Rate of Water | L/day | 2 | EPA, 1997a | 1 | (1) | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 234 | EPA, 1993 | |
| | ED | Exposure Duration | years | 24 | EPA, 1991 | 7 | EPA, 1993 | |
| | BW | Body Weight | kg | 59 | (1) | 59 | (1) | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | EPA, 1989 | 25,550 | EPA, 1989 | |
| | AT-N | Averaging Time (Non-Cancer) | days | — | — | 2,555 | EPA, 1989 | |

(1) Based on site-specific information and a letter, dated October 11, 2000, from Glenn Adams, US EPA Region 4, to David A. Ludder, Legal Environmental Assistance Foundation.

Sources:

EPA, 1997a: Exposure Factors Handbook

EPA, 1991: Standard Default Exposure Factors

EPA, 1989: RAGS Part A

EPA 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

TABLE 1
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
BROWN'S DUMP SITE

| | |
|----------------------|------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Unrestricted School Property |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose (2) | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|--|-------------------------------|------------------|------------------|-----------------|-----------------|---|---------------------|---------------------------|--------------------|----------------------|-------------------------|-------------------------------|-----------------|
| Ingestion | Antimony | 3.30E+000 | mg/kg | 3.30E+000 | mg/kg | M | 6.4E-006 | kg/kg-day | 4E-004 | mg/kg-day | | | 5.3E-002 |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 6.4E-006 | kg/kg-day | 3E-004 | mg/kg-day | | | 1.1E-001 |
| | (Total) | | | | | | | | | | | | 1.6E-001 |
| Dermal | Antimony | 3.30E+000 | mg/kg | 3.30E+000 | mg/kg | M | 1.5E-007 | kg/kg-day | 8.0E-005 | mg/kg-day | | | 6.2E-003 |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 1.5E-007 | kg/kg-day | 2.9E-004 | mg/kg-day | | | 2.6E-003 |
| | (Total) | | | | | | | | | | | | 5.2E-002 |
| Total Hazard Index Across All Exposure Routes/Pathways | | | | | | | | | | | | | 0.2 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Specify if subchronic.

TABLE E.7.2.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
BROWN'S DUMP SITE

| | |
|----------------------|-------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Restricted Area North of the School |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose (2) | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|--|-------------------------------|------------------|------------------|-----------------|-----------------|---|---------------------|---------------------------|--------------------|----------------------|-------------------------|-------------------------------|-----------------|
| Ingestion | Antimony | 1.90E+001 | mg/kg | 1.90E+001 | mg/kg | M | 6.4E-006 | kg/kg-day | 4E-004 | mg/kg-day | | | 3.0E-001 |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 6.4E-006 | kg/kg-day | 3E-004 | mg/kg-day | | | 7.5E-001 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 6.4E-006 | kg/kg-day | 7E-002 | mg/kg-day | | | 1.1E-001 |
| | Cadmium | 8.00E+000 | mg/kg | 8.00E+000 | mg/kg | M | 6.4E-006 | kg/kg-day | 5E-004 | mg/kg-day | | | 1.0E-001 |
| | Chromium VI | 7.90E+001 | mg/kg | 7.90E+001 | mg/kg | M | 6.4E-006 | kg/kg-day | 3E-003 | mg/kg-day | | | 1.7E-001 |
| | Copper | 4.10E+003 | mg/kg | 4.10E+003 | mg/kg | M | 6.4E-006 | kg/kg-day | 1E+000 | mg/kg-day | | | 2.6E-002 |
| | Iron | 1.10E+005 | mg/kg | 1.10E+005 | mg/kg | M | 6.4E-006 | kg/kg-day | 3E-001 | mg/kg-day | | | 2.3E+000 |
| | Manganese | 7.90E+002 | mg/kg | 7.90E+002 | mg/kg | M | 6.4E-006 | kg/kg-day | 7E-002 | mg/kg-day | | | 7.2E-002 |
| | Zinc | 2.80E+003 | mg/kg | 2.80E+003 | mg/kg | M | 6.4E-006 | kg/kg-day | 3E-001 | mg/kg-day | | | 6.0E-002 |
| | (Total) | | | | | | | | | | | | 4.5E+000 |
| Dermal | Antimony | 1.90E+001 | mg/kg | 1.90E+001 | mg/kg | M | 1.5E-007 | kg/kg-day | 8.0E-005 | mg/kg-day | | | 3.6E-002 |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 1.5E-007 | kg/kg-day | 2.9E-004 | mg/kg-day | | | 1.8E-002 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 1.5E-007 | kg/kg-day | 1.4E-002 | mg/kg-day | | | 1.3E-002 |
| | Cadmium | 8.00E+000 | mg/kg | 8.00E+000 | mg/kg | M | 1.5E-007 | kg/kg-day | 1E-004 | mg/kg-day | | | 1.2E-002 |
| | Chromium VI | 7.90E+001 | mg/kg | 7.90E+001 | mg/kg | M | 1.5E-007 | kg/kg-day | 6E-004 | mg/kg-day | | | 2.0E-002 |
| | Copper | 4.10E+003 | mg/kg | 4.10E+003 | mg/kg | M | 1.5E-007 | kg/kg-day | 8.0E-003 | mg/kg-day | | | 7.7E-002 |
| | Iron | 1.10E+005 | mg/kg | 1.10E+005 | mg/kg | M | 1.5E-007 | kg/kg-day | 6.0E-002 | mg/kg-day | | | 2.8E-001 |
| | Manganese | 7.90E+002 | mg/kg | 7.90E+002 | mg/kg | M | 1.5E-007 | kg/kg-day | 1.4E-002 | mg/kg-day | | | 8.5E-003 |
| | Zinc | 2.80E+003 | mg/kg | 2.80E+003 | mg/kg | M | 1.5E-007 | kg/kg-day | 8.0E-002 | mg/kg-day | | | 7.0E-003 |
| | (Total) | | | | | | | | | | | | 4.7E-001 |
| Total Hazard Index Across All Exposure Routes/Pathways | | | | | | | | | | | | | 5 |

- (1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 1-1
 CALCULATION OF NON-CANCER HAZARDS
 CENTRAL TENDENCY
 BROWN'S DUMP SITE

| | |
|----------------------|-------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Subsurface Soil |
| Exposure Medium: | Subsurface Soil |
| Exposure Point: | Restricted Area North of the School |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose (2) | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|--|-------------------------------|------------------|------------------|-----------------|-----------------|---|---------------------|---------------------------|--------------------|----------------------|-------------------------|-------------------------------|-----------------|
| Ingestion | Aluminum | 1.00E+004 | mg/kg | 1.00E+004 | mg/kg | M | 6.4E-006 | kg/kg-day | 1E+000 | mg/kg-day | | | 6.4E-002 |
| | Antimony | 4.10E+001 | mg/kg | 4.10E+001 | mg/kg | M | 8.4E-006 | kg/kg-day | 4E-004 | mg/kg-day | | | 6.6E-001 |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 6.4E-006 | kg/kg-day | 3E-004 | mg/kg-day | | | 1.9E+000 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 6.4E-006 | kg/kg-day | 7E-002 | mg/kg-day | | | 1.1E-001 |
| | Cadmium | 1.30E+001 | mg/kg | 1.30E+001 | mg/kg | M | 8.4E-006 | kg/kg-day | 5E-004 | mg/kg-day | | | 1.7E-001 |
| | Chromium | 1.30E+002 | mg/kg | 1.30E+002 | mg/kg | M | 6.4E-006 | kg/kg-day | 3E-003 | mg/kg-day | | | 2.8E-001 |
| | Copper | 1.30E+003 | mg/kg | 1.30E+003 | mg/kg | M | 6.4E-006 | kg/kg-day | 4E-002 | mg/kg-day | | | 2.1E-001 |
| | Iron | 2.20E+005 | mg/kg | 2.20E+005 | mg/kg | M | 6.4E-006 | kg/kg-day | 3E-001 | mg/kg-day | | | 4.7E+000 |
| | Lead | 3.80E+003 | mg/kg | 3.80E+003 | mg/kg | M | 6.4E-006 | kg/kg-day | - | mg/kg-day | | | - |
| | Manganese | 1.40E+003 | mg/kg | 1.40E+003 | mg/kg | M | 6.4E-006 | kg/kg-day | 7E-002 | mg/kg-day | | | 1.3E-001 |
| | (Total) | | | | | | | | | | | | 8.1E+000 |
| Dermal | Aluminum | 1.00E+004 | mg/kg | 1.00E+004 | mg/kg | M | 1.5E-007 | kg/kg-day | 2.00E-001 | mg/kg-day | | | 7.5E-003 |
| | Antimony | 4.10E+001 | mg/kg | 4.10E+001 | mg/kg | M | 1.5E-007 | kg/kg-day | 8.0E-005 | mg/kg-day | | | 7.7E-002 |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 1.5E-007 | kg/kg-day | 2.9E-004 | mg/kg-day | | | 4.6E-002 |
| | Barium | 1.20E+003 | mg/kg | 1.20E+003 | mg/kg | M | 1.5E-007 | kg/kg-day | 1.4E-002 | mg/kg-day | | | 1.3E-002 |
| | Cadmium | 1.30E+001 | mg/kg | 1.30E+001 | mg/kg | M | 1.5E-007 | kg/kg-day | 1E-004 | mg/kg-day | | | 2.0E-002 |
| | Chromium | 1.30E+002 | mg/kg | 1.30E+002 | mg/kg | M | 1.5E-007 | kg/kg-day | 6E-004 | mg/kg-day | | | 3.3E-002 |
| | Copper | 1.30E+003 | mg/kg | 1.30E+003 | mg/kg | M | 1.5E-007 | kg/kg-day | 8.0E-003 | mg/kg-day | | | 2.4E-002 |
| | Iron | 2.20E+005 | mg/kg | 2.20E+005 | mg/kg | M | 1.5E-007 | kg/kg-day | 6.0E-002 | mg/kg-day | | | 5.5E-001 |
| | Lead | 3.80E+003 | mg/kg | 3.80E+003 | mg/kg | M | 1.5E-007 | kg/kg-day | - | mg/kg-day | | | - |
| | Manganese | 1.40E+003 | mg/kg | 1.40E+003 | mg/kg | M | 1.5E-007 | kg/kg-day | 1.4E-002 | mg/kg-day | | | 1.5E-002 |
| | (Total) | | | | | | | | | | | | 7.8E-001 |
| Total Hazard Index Across All Exposure Routes/Pathways | | | | | | | | | | | | | 9 |

- (1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
 (2) Specify if subchronic.

TABLE A.1.CT
CALCULATION OF NON-CANCER HAZARDS
CENTRAL TENDENCY
BROWN'S DUMP SITE

| | |
|----------------------|-------------|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Groundwater |
| Exposure Point: | Showerhead |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose (2) | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|--|-------------------------------|------------------|------------------|-----------------|-----------------|---|---------------------|---------------------------|--------------------|----------------------|-------------------------|-------------------------------|-----------------|
| Ingestion | Heptachlor Epoxide | 3.85E-005 | mg/L | 3.85E-005 | mg/L | M | 2.1E-002 | kg/kg-day | 1.3E-005 | mg/kg-day | | | 6.2E-002 |
| | PCB-1016 (Aroclor 1016) | 1.00E-003 | mg/L | 1.00E-003 | mg/L | M | 2.1E-002 | kg/kg-day | 7E-005 | mg/kg-day | | | 3.0E-001 |
| | Arsenic | 6.27E-003 | mg/L | 6.27E-003 | mg/L | M | 2.1E-002 | kg/kg-day | 3E-004 | mg/kg-day | | | 4.4E-001 |
| | Manganese | 5.75E-001 | mg/L | 5.75E-001 | mg/L | M | 2.1E-002 | kg/kg-day | 2E-002 | mg/kg-day | | | 6.0E-001 |
| | (Total) | | | | | | | | | | | | 1.4E+000 |
| Total Hazard Index Across All Exposure Routes/Pathways | | | | | | | | | | | | | 1 |

- (1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 3.1.1.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
BROWN'S DUMP SITE

| | |
|----------------------|------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Unrestricted School Property |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 2.57E+000 | mg/kg | 2.57E+000 | mg/kg | M | 1.8E-007 | kg/kg-day | 7.3E+000 | (mg/kg-day) ⁻¹ | | | 2.0E-005 |
| | PCB-1260 (Aroclor 1260) | 3.50E-001 | mg/kg | 3.50E-001 | mg/kg | M | 1.8E-007 | kg/kg-day | 2.0E+000 | (mg/kg-day) ⁻¹ | | | 1.3E-007 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.70E-005 | mg/kg | 1.70E-005 | mg/kg | M | 1.8E-007 | kg/kg-day | 1.5E+005 | (mg/kg-day) ⁻¹ | | | 4.6E-007 |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 1.8E-007 | kg/kg-day | 1.5E+000 | (mg/kg-day) ⁻¹ | | | 1.4E-006 |
| | (Total) | | | | | | | | | | | | 2.2E-005 |
| Dermal | CPAHs | 2.57E+000 | mg/kg | 2.57E+000 | mg/kg | M | 4.8E-008 | kg/kg-day | 1.5E+001 | (mg/kg-day) ⁻¹ | | | 1.9E-008 |
| | PCB-1260 (Aroclor 1260) | 3.50E-001 | mg/kg | 3.50E-001 | mg/kg | M | 4.8E-008 | kg/kg-day | 4.0E+000 | (mg/kg-day) ⁻¹ | | | 6.7E-008 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.70E-005 | mg/kg | 1.70E-005 | mg/kg | M | 4.8E-008 | kg/kg-day | 3.0E+005 | (mg/kg-day) ⁻¹ | | | 2.4E-007 |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 4.8E-009 | kg/kg-day | 1.6E+000 | (mg/kg-day) ⁻¹ | | | 3.9E-008 |
| | (Total) | | | | | | | | | | | | 2.2E-006 |
| | | | | | | | | | | | | | 2E-005 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 1.1
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
BROWN'S DUMP SITE

| | |
|----------------------|------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Unrestricted School Property |
| Receptor Population: | Resident |
| Receptor Age: | Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 2.57E+000 | mg/kg | 2.57E+000 | mg/kg | M | 8.1E-008 | kg/kg-day | 7.3E+000 | (mg/kg-day) ⁻¹ | | | 1.5E-006 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.70E-005 | mg/kg | 1.70E-005 | mg/kg | M | 8.1E-008 | kg/kg-day | 1.5E+005 | (mg/kg-day) ⁻¹ | | | 2.1E-007 |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 8.1E-008 | kg/kg-day | 1.5E+000 | (mg/kg-day) ⁻¹ | | | 6.2E-007 |
| | (Total) | | | | | | | | | | | | 2.3E-006 |
| Dermal | CPAHs | 2.57E+000 | mg/kg | 2.57E+000 | mg/kg | M | 4.9E-008 | kg/kg-day | 1.5E+001 | (mg/kg-day) ⁻¹ | | | 1.9E-006 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 1.70E-005 | mg/kg | 1.70E-005 | mg/kg | M | 4.9E-008 | kg/kg-day | 3.0E+005 | (mg/kg-day) ⁻¹ | | | 2.5E-007 |
| | Arsenic | 5.10E+000 | mg/kg | 5.10E+000 | mg/kg | M | 4.9E-009 | kg/kg-day | 1.6E+000 | (mg/kg-day) ⁻¹ | | | 4.0E-008 |
| | (Total) | | | | | | | | | | | | 2.2E-006 |
| | | | | | | | | | | | | | 5E-06 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 3.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
BROWN'S DUMP SITE

| | |
|----------------------|-------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Restricted Area North of the School |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 1.13E+000 | mg/kg | 1.13E+000 | mg/kg | M | 1.8E-007 | kg/kg-day | 7.3E+000 | (mg/kg-day) ⁻¹ | | | 1.5E-006 |
| | Dieldrin | 5.90E-002 | mg/kg | 5.90E-002 | mg/kg | M | 1.8E-007 | kg/kg-day | 1.6E+001 | (mg/kg-day) ⁻¹ | | | 1.7E-007 |
| | PCB-1260 (Aroclor 1260) | 1.40E+000 | mg/kg | 1.40E+000 | mg/kg | M | 1.8E-007 | kg/kg-day | 2.0E+000 | (mg/kg-day) ⁻¹ | | | 5.0E-007 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.8E-005 | mg/kg | 8.80E-005 | mg/kg | M | 1.8E-007 | kg/kg-day | 1.5E+005 | (mg/kg-day) ⁻¹ | | | 2.4E-006 |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 1.8E-007 | kg/kg-day | 1.5E+000 | (mg/kg-day) ⁻¹ | | | 9.5E-008 |
| | (Total) | | | | | | | | | | | | 1.4E-005 |
| Dermal | CPAHs | 1.13E+000 | mg/kg | 1.13E+000 | mg/kg | M | 4.8E-008 | kg/kg-day | 1.5E+001 | (mg/kg-day) ⁻¹ | | | 8.1E-007 |
| | Dieldrin | 5.90E-002 | mg/kg | 5.90E-002 | mg/kg | M | 4.8E-008 | kg/kg-day | 3.2E+001 | (mg/kg-day) ⁻¹ | | | 9.1E-008 |
| | PCB-1260 (Aroclor 1260) | 1.40E+000 | mg/kg | 1.40E+000 | mg/kg | M | 4.8E-008 | kg/kg-day | 4.0E+000 | (mg/kg-day) ⁻¹ | | | 2.7E-007 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.80E-005 | mg/kg | 8.80E-005 | mg/kg | M | 4.8E-008 | kg/kg-day | 3.0E+005 | (mg/kg-day) ⁻¹ | | | 1.3E-006 |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 4.8E-009 | kg/kg-day | 1.6E+000 | (mg/kg-day) ⁻¹ | | | 2.7E-007 |
| | (Total) | | | | | | | | | | | | 2.7E-006 |
| | | | | | | | | | | | | | 2E-005 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE A.1.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
BROWN'S DUMP SITE

| | |
|----------------------|-------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Surface Soil |
| Exposure Medium: | Surface Soil |
| Exposure Point: | Restricted Area North of the School |
| Receptor Population: | Resident |
| Receptor Age: | Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 1.13E+000 | mg/kg | 1.13E+000 | mg/kg | M | 8.1E-008 | kg/kg-day | 7.3E+000 | (mg/kg-day) ⁻¹ | | | 6.7E-007 |
| | PCB-1260 (Aroclor 1260) | 1.40E+000 | mg/kg | 1.40E+000 | mg/kg | M | 8.1E-008 | kg/kg-day | 2.0E+000 | (mg/kg-day) ⁻¹ | | | 2.3E-007 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.80E-005 | mg/kg | 8.80E-005 | mg/kg | M | 8.1E-008 | kg/kg-day | 1.5E+005 | (mg/kg-day) ⁻¹ | | | 1.1E-006 |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 8.1E-008 | kg/kg-day | 1.5E+000 | (mg/kg-day) ⁻¹ | | | 4.3E-006 |
| | (Total) | | | | | | | | | | | | 6.2E-006 |
| Dermal | CPAHs | 1.13E+000 | mg/kg | 1.13E+000 | mg/kg | M | 4.9E-008 | kg/kg-day | 1.5E+001 | (mg/kg-day) ⁻¹ | | | 8.3E-007 |
| | PCB-1260 (Aroclor 1260) | 1.40E+000 | mg/kg | 1.40E+000 | mg/kg | M | 4.9E-008 | kg/kg-day | 4.0E+000 | (mg/kg-day) ⁻¹ | | | 2.7E-007 |
| | 2,3,7,8-TCDD (TEQ) - (Dioxin) | 8.80E-005 | mg/kg | 8.80E-005 | mg/kg | M | 4.9E-008 | kg/kg-day | 3.0E+005 | (mg/kg-day) ⁻¹ | | | 1.3E-006 |
| | Arsenic | 3.50E+001 | mg/kg | 3.50E+001 | mg/kg | M | 4.9E-009 | kg/kg-day | 1.6E+000 | (mg/kg-day) ⁻¹ | | | 2.7E-007 |
| | (Total) | | | | | | | | | | | | 2.7E-006 |
| | | | | | | | | | | | | | 9E-06 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

380271

TABLE 1
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
BROWN'S DUMP SITE

| | |
|----------------------|-------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Subsurface Soil |
| Exposure Medium: | SubSurface Soil |
| Exposure Point: | Restricted Area North of the School |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 1.37E+000 | mg/kg | 1.37E+000 | mg/kg | M | 1.8E-007 | kg/kg-day | 7.3E+000 | (mg/kg-day) ⁻¹ | | | 1.8E-006 |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 1.8E-007 | kg/kg-day | 1.5E+000 | (mg/kg-day) ⁻¹ | | | 2.4E-005 |
| | 2,3,7,8-TCDD (TEQ) (Dioxin) | 9.5E-005 | mg/kg | 9.50E-005 | mg/kg | M | 1.8E-007 | kg/kg-day | 1.5E+005 | (mg/kg-day) ⁻¹ | | | 2.6E-006 |
| | (Total) | | | | | | | | | | | | 2.6E-005 |
| Dermal | CPAHs | 1.37E+000 | mg/kg | 1.37E+000 | mg/kg | M | 4.8E-008 | kg/kg-day | 1.5E+001 | (mg/kg-day) ⁻¹ | | | 9.9E-007 |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 4.8E-009 | kg/kg-day | 1.6E+000 | (mg/kg-day) ⁻¹ | | | 6.8E-007 |
| | 2,3,7,8-TCDD (TEQ) (Dioxin) | 9.50E-005 | mg/kg | 9.50E-005 | mg/kg | M | 4.8E-009 | kg/kg-day | 3.0E+005 | (mg/kg-day) ⁻¹ | | | 1.4E-007 |
| | (Total) | | | | | | | | | | | | 1.7E-006 |
| | | | | | | | | | | | | | 3E-005 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 1
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
BROWN'S DUMP SITE

| | |
|----------------------|-------------------------------------|
| Scenario Timeframe: | Current/Future |
| Medium: | Subsurface Soil |
| Exposure Medium: | SubSurface Soil |
| Exposure Point: | Restricted Area North of the School |
| Receptor Population: | Resident |
| Receptor Age: | Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | CPAHs | 1.37E+000 | mg/kg | 1.37E+000 | mg/kg | M | 8.1E-008 | kg/kg-day | 7.3E+000 | (mg/kg-day) ⁻¹ | | | 8.1E-007 |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 8.1E-008 | kg/kg-day | 1.5E+000 | (mg/kg-day) ⁻¹ | | | 1.1E-005 |
| | 2,3,7,8-TCDD (TEQ) (Dioxin) | 9.50E-005 | mg/kg | 9.50E-005 | mg/kg | M | 8.1E-008 | kg/kg-day | 1.5E+005 | (mg/kg-day) ⁻¹ | | | 1.2E-006 |
| | (Total) | | | | | | | | | | | | 1.2E-005 |
| Dermal | CPAHs | 1.37E+000 | mg/kg | 1.37E+000 | mg/kg | M | 4.9E-008 | kg/kg-day | 1.5E+001 | (mg/kg-day) ⁻¹ | | | 1.0E-006 |
| | Arsenic | 8.80E+001 | mg/kg | 8.80E+001 | mg/kg | M | 4.9E-008 | kg/kg-day | 1.6E+000 | (mg/kg-day) ⁻¹ | | | 6.9E-007 |
| | 2,3,7,8-TCDD (TEQ) (Dioxin) | 9.50E-005 | mg/kg | 9.50E-005 | mg/kg | M | 4.9E-008 | kg/kg-day | 3.0E+005 | (mg/kg-day) ⁻¹ | | | 1.4E-006 |
| | (Total) | | | | | | | | | | | | 1.7E-006 |
| | | | | | | | | | | | | | 1E-005 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 1
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
BROWN'S DUMP SITE

| | |
|----------------------|-------------|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Groundwater |
| Exposure Point: | Tap |
| Receptor Population: | Resident |
| Receptor Age: | Child |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | Aldrin | 2.60E-005 | mg/L | 2.60E-005 | mg/L | M | 6.1E-004 | kg/kg-day | 1.7E+001 | (mg/kg-day) ⁻¹ | | | 2.7E-007 |
| | Heptachlor Epoxide | 3.85E-005 | mg/L | 3.85E-005 | mg/L | M | 6.1E-004 | kg/kg-day | 9.1E+000 | (mg/kg-day) ⁻¹ | | | 2.1E-007 |
| | PCB-1016 (Aroclor 1016) | 1.00E-003 | mg/L | 1.00E-003 | mg/L | M | 6.1E-004 | kg/kg-day | 4.0E-001 | (mg/kg-day) ⁻¹ | | | 2.2E-006 |
| | Arsenic | 6.27E-003 | mg/L | 6.27E-003 | mg/L | M | 6.1E-004 | kg/kg-day | 1.5E+000 | (mg/kg-day) ⁻¹ | | | 5.7E-006 |
| | (Total) | | | | | | | | | | | | 8E-006 |
| | | | | | | | | | | | | | 8E-006 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 8.CT
CALCULATION OF CANCER RISKS
CENTRAL TENDENCY
BROWN'S DUMP SITE

| | |
|----------------------|-------------|
| Scenario Timeframe: | Future |
| Medium: | Groundwater |
| Exposure Medium: | Groundwater |
| Exposure Point: | Tap |
| Receptor Population: | Resident |
| Receptor Age: | Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Reference Concentration | Reference Concentration Units | Cancer Risk |
|----------------|-------------------------------|------------------|------------------|-----------------|-----------------|---------------------------------------|-----------------|-----------------------|---------------------|---------------------------|-------------------------|-------------------------------|-------------|
| Ingestion | Aldrin | 2.60E-005 | mg/L | 2.60E-005 | mg/L | M | 1.1E-003 | kg/kg-day | 1.7E+001 | (mg/kg-day) ⁻¹ | | | 4.9E-007 |
| | Heptachlor | 3.90E-005 | mg/L | 3.90E-005 | mg/L | M | 1.1E-003 | kg/kg-day | 4.5E+000 | (mg/kg-day) ⁻¹ | | | 1.9E-007 |
| | Heptachlor Epoxide | 3.85E-005 | mg/L | 3.80E-005 | mg/L | M | 1.1E-003 | kg/kg-day | 9.1E+000 | (mg/kg-day) ⁻¹ | | | 3.8E-007 |
| | Arsenic | 6.27E-003 | mg/L | 6.27E-003 | mg/L | M | 1.1E-003 | kg/kg-day | 1.5E+000 | (mg/kg-day) ⁻¹ | | | 1.0E-005 |
| | (Total) | | | | | | | | | | | | 1.1E-005 |
| | | | | | | | | | | | | | 1E-005 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.